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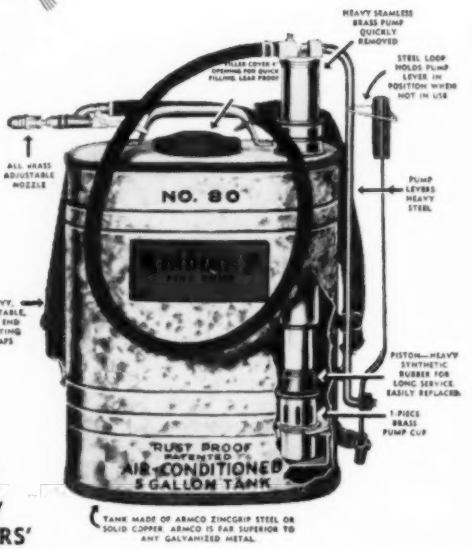
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Log deck of the Long Bell Lumber Company, Weed, Calif. (Mt. Shasta in background.)

Photo courtesy Hammon, Jensen & Wallen.

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Snow Storage and Melt in a Northern Hardwoods Forest

Richard S. Sartz
and George R. Trimble, Jr.
Northeastern Forest Experiment Station
Forest Service, U. S. Dept. Agriculture

RESEARCH in the coniferous forests of the West has shown that forest-management practices that influence mountain snow packs[1] can offer real opportunities for streamflow regulation. It has shown that, by manipulating the forest cover, man can modify both the amount of snow that accumulates and its rate of melt; and thus he can affect the water supplies that are available for streamflow.

But what about the hardwood forests of the Northeast? To what extent do these same opportunities exist here? In most of the East, snow packs do not accumulate over the winter. But in some parts of the more northern states they do—especially in the mountainous sections. In the White Mountains, a spring snow pack may contain 30 percent or more of the annual precipitation; and this would represent a still larger proportion of the annual streamflow.

Knowledge about the formation and melt of snow packs under hardwood stands is meager indeed. Some of the published information is even contradictory. Few studies have been made in the East, and none of these dealt with accumulated snow packs. Maule (*5*), who measured net snowfall from separate storms under different types of stands in Connecticut, found "practically the same amount of snow" under hardwood stands of different ages as fell in the open. Morey (*6*) reported that a 60-year-old northern hardwood stand in Vermont intercepted 10 percent of the snow that fell during one storm. This is the extent of the pertinent literature on snow in eastern hardwood forests.

To find out more about the influence of northern hardwood forests on snow, a study was begun in the White Mountains of New Hampshire in 1955.

Fundamental Concepts

Forests have a two-fold effect on snow: they decrease net snowfall by intercepting falling snow; and, after it has reached the ground, they affect its disposition by shading and, perhaps, by other thermal effects. Since it is difficult to measure these influences directly, their integrated effect is determined by measuring the residual; that is, by measuring the amount of snow in the forest, and then comparing this with the amount measured outside the zone of the forest influence.

For such a comparison to be completely valid, the forest and the nonforest area must receive the same amount of gross snowfall, and they must be subject to the same orographic and solar influences. To satisfy these requirements, the open area should be a part of the same topographic facet as the forest, it should be completely surrounded by the forest, and for this type of study it should be small enough that differential wind movement between the two is unlikely. At the same time, the opening must be large enough so that part of it is uninfluenced by the shading and interception effects of the forest stand that surrounds it.

The Experimental Area

All of these conditions were met on the Bartlett Experimental Forest, in the White Mountains of New Hampshire. Here small patches had been clearcut in both saw timber and pole-size northern hardwoods stands for forest-management research studies. These patch cuttings provided the open areas needed for the study. The forest of beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), paper birch (*Betula papyrifera*), sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), and white ash (*Fraxinus americana*) is considered to be well representative of the northern hardwoods type in the White Mountains.

Three openings in a pole stand and one in a saw timber stand were found that met the requirements of the study. The terrain was smooth, and the topography conformed with the surrounding stand. All plots were on gently sloping north aspects. In the pole stands the openings were on a slope of 10 percent, in the saw timber stand on a 5 percent slope.

All the openings were somewhat irregular in shape, and at the widest point were about as wide as twice the height of the surrounding trees. Average heights of the trees were 60 feet for the pole timber and 80 feet for the saw timber. The saw timber plot was approximately 1 mile from the pole timber plots, and 200 feet higher in elevation.

Methods

Snow depth and water equivalent were measured with the Mt. Rose snow tube and tubular scales.

[1]Snow pack: An accumulation of snow from a number of storms. In very cold climates the snow pack begins to build up in the fall and reaches its maximum depth in the spring before melt begins.

Readings were recorded to the nearest ½ inch. The first measurements were made early in March—about the time the peak snow pack might be expected. Re-measurements were made at intervals through March and April to trace the recession of the snowpack. The last measurements were made on April 21. By this time, most of the snow was gone from the study areas. Each opening and its surrounding stand was treated as a separate sampling unit.

Two sampling systems were used. The first was designed to determine snow-pack differences between the open and forest areas before the melt period began. To do this, those measurements that represented the true open and true forest conditions had to be separated from those that represented the fringe zones.

This was done by spacing the measuring points along lines that radiated from the centers of the openings, like spokes on a wheel (Fig. 1) and extended into the forest. Distance from the edge of the canopy was recorded for each point. Plotting snow depth and water content over distance, then, showed the points that fell in the fringe zone. These were eliminated from the data when the open-forest comparisons were made. Four and six sampling spokes were used. Excluding fringe-zone measurements, at least 25 points were sampled in each condition at each pole timber plot, 16 points at the saw timber plot.

A different sampling method was used after the beginning of spring melt. The reasoning behind it was this: forests affect snow melt mostly by shading the snow surface; at noon, when the angle of incidence of the sun's rays is greatest, trees cast their shadows to the north; the melt rate differential between shaded and unshaded areas should, therefore, run in a north-south direction. North-south sampling lines should best show this.

Accordingly, measurements during the melt period were made along four parallel sampling lines that ran across the plots in a north-south direction (Fig. 1). The fringe zone was not sampled. These data were plotted by distance from the north or south edge of the canopy to show the pattern of snow melt in both the open and forest areas.

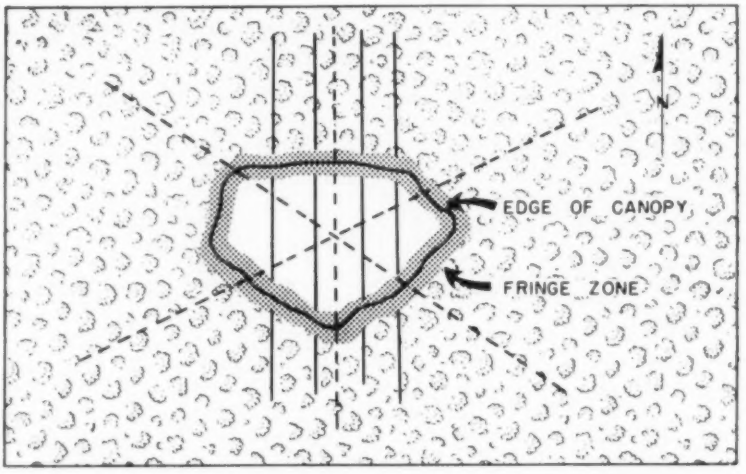

FIG. 1.—Schematic sketch of a sampling unit, showing the two systems of lines used to sample both forest and open areas.

Snow depth, water content, and density differences between the open and the forest areas before spring melt began were tested for statistical significance by the standard *t*-test.

Discussion of Results

Snow depths, water contents, and densities for the late winter and early spring measurements are shown in Table 1. All differences are highly significant except water content for the saw timber plot. This is statistically nonsignificant.

The snow in the open was consistently deeper—21 to 28 percent—than in the woods. And the relative difference was about the same for saw timber and pole timber.

Corresponding differences for water content were much less pronounced. There was more snow water in the open than in the woods, but the differences were not nearly so great as the depth differences. Openings in the pole stand had 7 to 10 percent more snow water than the woods, but the opening in the saw timber stand had only 4 percent more than the woods.

The snow pack in the woods was consistently more dense—18 to 26 percent—than that in the open (Table 1); and this difference persisted through the melt period. The best explanation for this seems to be the phenomenon described by Forsling (*2*) as the melting of snow through the absorption of sunlight by the boles of the trees and re-radiation of heat to the snow around them. The trees absorb not only the direct sun's rays, but reflected radiation from the snow surface as well; thus, heat is

TABLE 1.—COMPARISON OF SNOW PACK IN WOODS AND IN OPEN BEFORE SPRING MELT

Date	Snow depth			Water content			Density		
	Open	Forest	Dif.	Open	Forest	Dif.	Open	Forest	Dif.
	Inches			*Inches*			*Percent*		
Pole timber plots:									
March 4	39.8	29.6	10.2**	9.8	9.1	0.7**	25	31	6**
March 17	34.8	25.0	9.8**	9.6	8.6	1.0**	28	34	6**
Saw timber plot:									
March 17	40.2	31.7	8.5**	9.4	9.0	0.4	23	29	6**

**Highly significant.

FIG. 2.—Snow melt in the forest began at the tree trunks and extended from them in ever-widening circles of bare ground as the melt period progressed.

absorbed and re-radiated by the trees in all directions.

This may explain the melt rings that appeared around tree boles, snags, and to a lesser degree, around boulders early in the melt period. These rings became constantly wider as the melt period progressed (Fig. 2).

Before the melt period began, the influence of the forest was restricted largely to the area immediately under the trees. This agrees with Connaughton's findings for ponderosa pine (*1*). When plotted by distance from the edge of the canopy, the data showed a fringe zone of about 10 feet on either side. So in computing the averages, no measurements within this zone were included.

The effect of tree shadows on snow melt is shown graphically in Figure 3. The points represent averages for all pole timber plots. Distances are from the edge of the forest canopy in a north-south direction. The snow pack receded in this direction as the length of the shadows at midday shortened.

Snow melt on all the plots followed this pattern: fastest melt in the north portion of the opening and in that part of the woods adjoining it that was not shaded by the trees to the south; next fastest in the shaded woods where heat reflected by the boles of the trees was a factor; slowest of all in the south sector of the opening where the snow pack was shaded by the trees south of it, but where reflected heat was minimal.

By April 15, the north ends of all plots were bare, and the bare area extended northward into the stands for a distance of 25 to 50 feet, depending upon the size of the opening, the degree of slope, and the height of the trees. Snow was continuous in the woods beyond the influence of the openings, except for melt rings around trees. Snow depth between the trees was about half that in the south sector of the openings. By April 21, the ground in the woods was bare, but a narrow belt of snow still remained in the south end of each opening (Fig. 4).

The snow pack apparently began to lose water by melting when the density of the snow reached about 30 percent. Although this is in sharp contrast to the ripe snow densities of 40 to 50 percent found in the West, it agrees with Gerdel's conclusions from Garstka's study in Michigan (*3*).

During periods of accelerated melt from solar radiation, the effect of even small differences in aspect and degree of slope on the rate of melt was very apparent. The density also appeared to increase in variability as melt progressed. This was probably due to irregular settling of the snow pack as water percolated from it. At places this produced hollows within the snow pack that were invisible because the surface snow was bridged over them.

Results of this study emphasize the difficulty in correctly interpreting comparative snow-measurement data in hardwood forests. Because we are measuring only the effects, we can only speculate as to the exact causes of the differences.

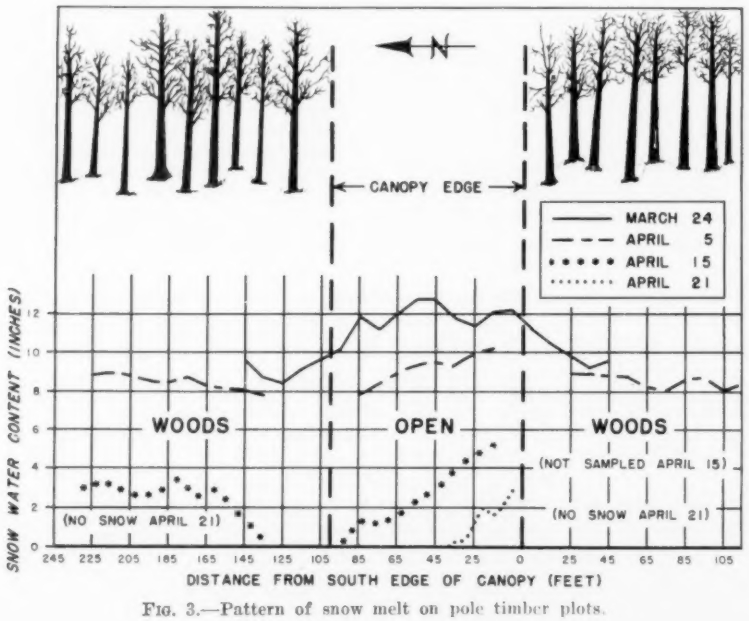

FIG. 3.—Pattern of snow melt on pole timber plots.

FIG. 4.—Residual snow pack on pole plot No. 1 on April 21, seen as looking south from the center of the opening.

In other words, we have no way of knowing for certain how to break down the multiple effect of forests on snow into its separate components: interception, and melt, and sublimation effects. For this reason we cannot say from this study that the forest intercepted so much snow. We can only say that the snow pack in the forest and in the open differed by these amounts.

Possible Application

Although this was a preliminary study, limited to gentle, north-facing slopes, basic relationships that were uncovered suggest a possible application on similar terrain. The study showed that snow accumulation in hardwood forests can be increased and melting of the snow pack prolonged by cutting narrow openings in an east-west direction.

The width of the openings that would do this most effectively depends on the latitude, aspect, slope percent, and height of the trees. These factors affect the angle of incidence of the sun's rays and the amount of direct solar radiation that reaches the snow surface. On the area studied a strip about 30 to 40 feet wide appears to be best. On steeper slopes or with taller trees, wider strips could be used.

To what extent the same relationships would be effective in eastern hardwood forests on other aspects is not yet known and must await further study. However, Haupt's report on a similar study in ponderosa pine suggests that strip cuttings would have the most effect on north slopes and the least on south slopes (*4*).

The differences in snow water content between the open areas and the hardwood stands at the time of maximum snow pack were not large, even for the pole timber stand—and this stand probably represents as dense a canopy as can be found in the northern hardwood forest type. For the saw timber stand the difference was negligible and statistically nonsignificant. During the melt period these differences were still small compared with those generally found in softwood forest types. Additional research is needed to determine whether these small snow water differences will influence the quantity and timing of streamflow.

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Kinne F. Williams (1892-1956)

Kinne F. Williams, 63, assistant director of the Division of Lands and Forests, New York State Conservation Department, died at Albany June 18 after a brief illness.

Born September 14, 1892 at Phoenix, N. Y., Mr. Williams was a 1917 graduate of the New York State College of Forestry. In that year he entered the State Conservation Department of New York, rising to the position of superintendent of forest fire control in 1927, and subsequently advancing to assistant director.

Stand Establishment Costs and the Theory of Relative Forest Rent

Rudolfs Markus[1]

FOR PURPOSE of discussion, let us assume we have an 80-acre working group of 80 even-aged loblolly pine stands (normally distributed) on an 85-foot site. The group is being managed on a sustained-yield basis with a rotation of 80 years, but in order to maintain the present productivity and possibly improve the growing stock, reproduction costs of $30 per acre are considered necessary for a period of years to come. We are confronted with the question, "Is management able to sustain such a cost?"

Many foresters feel this question can only be answered by inserting appropriate data in the soil-value formula,

$$S = \frac{Y + T_a(1+p)^{m-a} + T_b(1+p)^{m-b} + \ldots - c(1+p)^m}{(1+p)^m - 1} - E \qquad (1)$$

Where
S=soil value.
Y=Net stumpage value per acre in final cutting.
T_a=Net income from thinning, stand age a.
T_b=Net income from thinning, stand age b.
p=Interest rate.
a=Present year, or year a dating from origin of stand.
m=Rotation age.
c=Cost of reproduction or stand establishment.
E=Capital value of annual expenses.

If yield and cost data suggested by Chapman[2] as being appropriate, are inserted, we arrive at a negative soil value of $-2.71 per acre at 3 percent, and $-18.27 at 4 percent. This indicates the cost of $30 per acre for stand reproduction is prohibitive.

On the other hand, the forest as a going concern produces a forest rent,

$$E = \frac{Y + T_a + T_b + \ldots - me - c}{m}$$

where e signifies annual expenses for the forest and m the number of age classes or stands in the forest. Inserting Chapman's data, we derive an annual forest rent of $3.08 per acre, indicating that the cost of $30 *is* bearable.

The controversy over the allowable amount of reproduction costs has weighed heavily on the minds of foresters ever since the advent of commercial forestry. Dr. Eugen Ostwald (1851-1932), a renowned scientist with the richest possible experience in practical forestry as manager of large forest estates, both private and municipal, has made a great contribution to the clarification of the economic nature of the forest enterprise. His ideas, constituting his so-called "Relative Forest Rent Theory," are laid down in his two fundamental books: (1) *Fortbildungsvortrage uber Fragen der Forstertragsregelung* (Advanced Lectures on Forest Yield Regulation), 1915, and (2) *Grundlinien einer Waldrententheorie* (Outline of a Forest Rent Theory), 1932.

Educated in Tharandt (Saxony, Germany) on the ideas of the soil-rent theory by Pressler and Judeich, he could not possibly reconcile the tenets of the school with his experiences as practical forester. Since the time element, the "fourth dimension," so heavily underlies forest economics and the application of compound interest over unusually long periods of time leads to results which seem to be beyond the realm of reality, Ostwald found their practical usefulness in their relativity. The principle of relativity therefore constitutes one of the main buttresses of Ostwald's forest-rent theory.

The stand-establishment cost was one of the problems Ostwald took in stride. The crucial question in this case was whether the reproduction cost is to be charged compounded against the following (resulting) final yield, or against the immediately preceding final yield.

The fundamental dogma of the soil-rent theory, as reflected in the soil-value formula itself, is that the stand-establishment costs are of the nature of a working capital which, laid out at the start of the operation, is to be returned compounded by the final yield at the end of the operation (rotation) period. The soil alone is regarded as a fixed investment. Soil rent is considered the legitimate yardstick of the forest enterprise.

According to Ostwald, distinction is to be drawn between the initial and the subsequent stand-establishment costs. The initial cost is a fixed investment like the soil itself, and is tied up in the forest enterprise as long as it exists. The subsequent establishment costs, on the other hand, are designed to restore the forest growth killed by the immediately preceding removal of the mature stand. These costs, being reproduction costs, belong to the category of capital maintenance costs chargeable to the yield that required the reproduction.

This dual nature of stand-establishment costs can be expressed mathematically by a simple transformation of the soil-value formula. But in order that our attention be focused on the main factors involved, viz., the final yield Y and the stand-establishment cost c, let

[1]Dr. Markus was formerly director of the Latvian forest research institute and is now a resident of Norfolk, Virginia.

[2]Chapman, H. H., and W. H. Meyer, Forest valuation. McGraw-Hill Book Co., Inc. New York. 1947. p. 171.

us use a simplified soil-value formula

$$S = \frac{Y - c(1+p)^m}{(1+p)^m - 1}$$

since the administrative costs and the intermediate cuttings play no part in this discourse. This formula can also be presented

$$S = \frac{Y - c}{(1+p)^m - 1} - c,$$

where c appears in two different phases with regard to the time of its occurrence. Over the fraction line c is associated with the final yield Y, both of them occurring at the end of the rotation period m. The c outside the fraction is the initial outlay at age zero. Designating them respectively c_m *and* c_o and transposing, we obtain

$$S + c_o = \frac{Y - c_m}{(1+p)^m - 1} \qquad (2)$$

This is Ostwalds' formula where the initial stand-establishment cost c_o as a fixed investment is associated with the soil capital S, but the subsequent reproduction costs c_m as capital-maintenance costs are charged to the final yield Y.

Though derived from the original (in this case simplified) soil-value formula (1), Ostwald's formula expounds a diametrically different philosophy. Since c_o represents the stand value at the age zero, which also can be interpreted as the initial growing stock in an isolated stand management, the left side of Ostwald's equation (2) signifies the forest capital which in $_m$ years produces a forest rent $Y - c_m$. Or mathematically,

$$(S + c_o)[(1+p)^m - 1] = Y - c_m$$

Ostwald's formula thus is a forest rent formula covering both the isolated stand and the sustained-yield forest, the rent being intermittent in one case and annual in the other. By bringing these two forms of forest management under a common system Ostwald closed the ungraceful economic-ideological gap between them, since the isolated stand had been the exclusive domain of the soil-rent theory, whereas the sustained-yield forest was the medium of the old-style forest-rent school.

At issue is the question whether the growing stock should be classified as a working capital (soil-rent theory) or as a fixed investment (Ostwald). As the soil-rent theory implies, the growing stock is truly the growing product itself. But it is also true that the growing stock is a substance that produces the wood product, and in sustained-yield management a certain amount of this substance is necessary in order to maintain a steady flow of wood products. The amount of the growing stock and its composition completely determines the amount of the forest rent. Therefore, the maintenance of the status quo of the growing stock is vital in practical forestry.

Since there are no outward distinctions between the production plant and the product itself, the need for controlling the growing stock is more compelling. This consideration leads to the conclusion that the growing stock can and will be adequately safeguarded if put in the category of a fixed investment that calls for regular check-ups. The history of forest management in Saxony, citadel of soil-rent theory, illustrates clearly enough that this theory suffered its most crushing setback due to its neglect of the growing stock. Thus, economically the growing stock is to be regarded as the main substance entitled to all the care and consideration of a fixed investment; it is simply a measure of practical expediency if forestry is to fulfill its invaluable economic service.

Stand establishment is actually stand reestablishment with the financial means being provided by the yield of the removed stand, hence $Y - c_m$ in formula (2). This implies that the stand reproduces itself not only biologically but economically as well, causing no accumulation of interest of any kind on the reproduction cost. It is only common sense that economic considerations and theories should be guided by experience, with nature as its main source. Never should they run counter to laws of nature as did the deductive thinking of the natural philosophy of which the soil-rent theory is a typical example.

The leading formula of the natural philosophy that anything that is real is also reasonable, and vice versa, anything that is reasonable is also real, is responsible for the figment that a forest enterprise starts on a bare soil with planting being the first step. It sounds reasonable but is utterly unreal for the "economic man" in his pursuit of an immediate profit. The fact is that forestry has been conditioned on the presence of an ample growing stock, with cutting instead of planting being the first action.

The distortion by soil-rent theory of the natural sequence of operations in forestry has obscured one of the most characteristic features of practical forestry, namely the interplay between the cutting and reproduction which usually go hand in hand and have become synonyms in biological terms. It is natural that this biological interplay should affect the economic aspects of the reproduction process. The economic interdependence between the final yield Y and the chosen method of regeneration is so close that the amount of the reproduction cost by itself is meaningless without reference to the corresponding yield Y. Statistically decisive is only the difference $Y - c_m$, i.e., a higher reproduction expense may be warrented if it holds out a higher difference $Y - c_m$. This highly significant economic facet of reproduction doesn't find expression in the soil-rent formula, because the soil-rent theory has paired the final yield with the initial stand establishment cost c_o (compounded). The most spectacular difference between the soil-rent theory and Ostwald's forest-rent theory is that the former considers the production cycle as ending up with the cutting of the mature stand, leaving bare ground on which a new cycle may be started. Ostwald's formula shows the production cycle completed after the cutover is reestablished, which is in accord with the requirements of sustained-yield forestry.

Confusion over the problem of reproduction costs makes itself felt whenever a condition arises requiring an outlay in excess of what the

final yield is capable of bearing in terms of compounded charges. In this connection, Hawley and Smith[3] have written, "expensive treatments of this kind can be justified only by results of the highest quality, although they are in practice paid for out of the proceeds of the sale of the previous crop of virgin timber." (The treatment involves slash disposal and soil scarification preparatory to seeding or planting.) Why should the higher costs of reproduction be charged to the previous final yield but the lower ones be carried at compound interest into the next rotation to be charged to the succeeding final yield? This presents a perplexing situation from a merely didactical point of view. The confusion students feel after completing their studies of forest finance or forest valuation is due to the lack of clear-cut and practically tested principles in forestry. Though biologically forest stands and other plant societies perpetuate themselves, the student is asked to believe that economically reproduction comes from succeeding stands. This sounds preposterous.

The foregoing considerations speak for Ostwald's way of handling the stand establishment costs, viz, $Y-c_m$ instead of $Y-c_o\,(1+p)^m$. A revision of soil-rent teachings which have outlived their usefulness in the light of the today's science is overdue, and Ostwald's fundamental ideas constitute a solid foundation for this revision.

[3]Hawley, R. C. and D. M. Smith. The practice of silviculture. John Wiley & Sons. New York. 1954. 6th ed. p. 296.

Conclusions

(According to E. Ostwald)

1. Distinction is to be drawn between initial (c_o) and subsequent (c_m) stand establishment costs:

   a. The initial establishment cost c_o represents a fixed investment.

   b. The subsequent establishment costs c_m are reproduction costs and represent capital-maintenance costs designed to restore the forest growth killed by the removal of the mature stand.

2. The initial stand-establishment cost c_o and the soil capital S constitute the forest capital of an isolated stand management; it is an indivisible unit $S+c_o$ that in the rotation period produces the forest rent $Y-c_m$.

3. The reproduction costs c_m are charged as capital-maintenance costs to the preceding final yield Y, which means that the stand perpetuates itself not only biologically but economically as well, in distinction from the soil-rent theory which teaches that the reproduction costs must come from the succeeding crop.

Massachusetts' Forests

Two-thirds of the land in Massachusetts is forest land, but the state is not producing nearly as many trees as it could, according to a survey conducted by the Forest Service, as a part of a nationwide review of the timber resources. The survey was carried out by the Northeastern Forest Experiment Station, in cooperation with the Massachusetts Department of Natural Resources, Division of Forests and Parks.

Massachusetts' 3,300,000 acres of forest land are growing about 2.5 billion board feet of saw timber. Most of the commercial forest land is stocked with small trees. Only 12 percent contains 1,500 or more board feet to the acre, which is considered too small a proportion in this class. Four-fifths of the saw timber is of low quality.

Saw timber volume is about equally divided between softwood and hardwood trees. Of the 1,300 million board feet of softwood, almost 900 million are white pine; the rest is hemlock. Oaks make up 600 million board feet of the 1,400 million board feet of hardwoods. Softwood saw timber is growing about as fast as it is being cut. Hardwood, however, is growing nearly three times as fast.

Nine-tenths of the forest land is privately owned. Less than one-tenth is owned by forest industry. More than half the forest land is in 21,000 private holdings that are neither farm nor industrial.

A copy of the report may be obtained from the Northeastern Forest Experiment Station, 102 Motors Avenue, Upper Darby, Pa.

Economics for Forest Managers—a Changing Emphasis

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PROFESSIONAL as well as public attitudes and approaches to forestry have changed markedly during the last twenty-five years. Until fairly recently laymen, and many foresters, considered forestry primarily a moral issue concerning the conservation of forests and forest productivity for future generations. But today, forestry is also widely accepted as a very profitable private economic endeavor.

Coincident with this realization that the production of trees, as well as lumber, offers profitable investment opportunities, has been the development of an interest in economic principles that could be used by forest managers in analyzing their forest production problems. With larger values on the returns' side of the ledger, foresters as well as businessmen could conscientiously rely to a greater extent on cost and return analyses to select the most appropriate forestry practices.

This paper will first seek to analyze the nature of changes that are taking place in the American concept of the functions and content of forest-management economics. The relevance of several traditional managerial problems will then be examined to indicate the implications of current emphases. An improved understanding of the nature of these changes may help the forest manager select the most useful analytical tools for his particular problem. It should also help indicate fruitful approaches in forest-management research and professional education.

To be sure, there have been no really revolutionary developments in the field of economics during the past fifty years that offer a new methodology appropriate for analyzing forestry alternatives. But the economics of forest management as presented in Fernow's *Economics of Forestry* (*6*), in Chapman's *Forest Valuation* (*2*) and *Forest Finance* (*3*), and in forestry periodicals prior to 1930, included a somewhat different subject matter and a distinctly different emphasis from that evident in today's management, journal articles, and research. Such changes as are indicated herein do not imply any criticism of earlier emphases, as emphases usually are appropriate to contemporary knowledge and interest.

Traditional Elements

According to writings by our early management and economics authors, primary emphasis in forest-management economics was centered about four general subjects.

Adequate resources. — Fernow (*6*) was particularly concerned about the problem of obtaining "good" forest management on sufficient land to produce adequate supplies of timber for future needs. But rather than stressing the effect of these needs and prospective supplies on future prices, concern was expressed about severe absolute "shortages," in terms of physical quantities. Later writers did not concern themselves directly with this problem, but it obviously influenced their thinking. For example, many management authors expressed concern over the depressing effect of high taxes and the lack of available insurance and credit facilities on extending intensive forestry practices to additional ownerships.

Managerial costs.—Until recently very little was known of the risks and costs involved in managing American forestry enterprises. Thus early texts and other literature dealt at some length with protection costs and risk, the lack of available insurance for forest investments, the existence of apparently excessive property taxes, and the long-run earning capacity of forest investments compared with interest rates on credit available to farmers and other small timberland owners. Discussions pertaining to such costs were largely descriptive, with some attention to average magnitudes of fire and other losses, taxes, and interest rates.

Accounting.—A system of records showing periodic expenditures and incomes is essential to every business enterprise. Unlike most enterprises, forestry has a production period several decades long. Thus the soundness of one year's forest-management practices cannot be evaluated by the records of cash costs and incomes for that single 12-month period. But such records were customary and also were necessary for income tax and other purposes. Attempting to make these records more useful for managerial purposes, early forest economists recommended recording imputed interest as a cost. Increases in capital value due to growth and appreciation were also to be recorded as income. But such recommendations have received little acceptance because they are contrary to standard accounting procedures.

Little attention was given to studies of operational efficiency by cost-accounting or other techniques. We were not ready for such refinements.

Valuation.—Traditionally, valuation in its broadest sense has included the study of methods for evaluating the profitability of various long-range forestry programs, and methods for appraising the value of standing timber for immediate conversion into wood products. The majority of such analyses provided answers to two questions, namely: "Under the specified assumptions concerning management, costs, and output, what could I afford to pay for the property (or stumpage) in question?"

[1]Dr. Stoltenberg recently joined the staff of the Northeastern Forest Experiment Station, Upper Darby, Pa.

(i.e., on what capital investment would the expected returns form a satisfactory rate of return?) Or, given the cost of a specific silvicultural treatment, "Will the increased returns from this treatment give me a satisfactory return on this additional investment?" Such questions normally seek a "yes" or "no" answer, or sometimes a specific rate of return on the given investment.

Noteworthy also is that these were basically static analyses. Present conditions, including prices and costs, were usually assumed to continue indefinitely (in calculations). The effect of changing conditions on future management was normally not appraised. The European tradition of formal, long-term, relatively inflexible management plans obviously influenced the form of these early economic analyses.

Valuation is related to the bookkeeping phases of accounting in that both deal with production costs and incomes. However, a clear and vital distinction between the two is the direction one is "facing" when he views such data. Bookkeeping is concerned with the recording of historical costs and incomes—and in some cases with the assignment of costs to specific units of production according to "standard" accounting procedures. Such assignment may be "standard" because of income tax or other laws or because in most businesses the method specified is useful. On the other hand, the concern in valuation analyses is entirely with the future. Data from historical bookkeeping records are appropriately used in valuation calculations only if they provide valid estimates of future costs or if they will affect future net returns. (For example, the actual dollar investment in timber as recorded in the asset account will enter into valuation calculations concerning that timber only inasmuch as it will affect future costs, vis., future income or capital-gain taxes through depletion allowances.)

Failure to clearly distinguish between the role of historical bookkeeping entries and costs and incomes appropriate to valuation analyses has led to considerable confusion in forest-management literature.

Current Emphases in Economic Analysis

With changing economic conditions, modification of these traditional emphases became appropriate. Basically such changes have developed from the need of forest managers for sounder and more accurate methods and data to serve as managerial guides. Foresters are no longer as concerned with whether or not to grow trees, but more with how many, what kind, how, and where!

The importance of property taxes and long-term resource analyses has not been reduced. But since such matters as property taxation usually cannot be influenced by the individual manager, they have been transferred to more appropriate subject-matter fields in forest economics, sometimes to forest policy.

General resource analyses have become so complex that they too are no longer considered a part of managerial economics. The success of individual forestry enterprises still depends to a large extent on the ability of top management to anticipate future markets. But forest managers today are provided with greatly improved data to guide their decisions. Published during the past five years were the first major forest-production analyses to include qualitative and quantitative appraisals of future shortages—thus helping managers interpret the effect of "shortages" on future prices.

In education, courses in forest-management economics rely heavily on principles taught in earlier courses in economic theory and forest economics. On this foundation the management course can deal with the problems of applying the analytical methodology of economics to specific managerial problems —not to find "the best" forestry practices but rather to learn the use of these analytical tools.

For convenience in presentation, current forest-management economics will hereafter be referred to in this paper as *economic analysis* Perhaps a change in terminology will help avoid preconceived ideas about the "new" scope of the field. As with any growth, changes noted have not occurred abruptly but are in the process of slow development. And some overemphasis may be necessary to identify clearly the changes that are taking place. The following seem to be the key emphasis in economic analysis.

Short-run decisions.—The futility of long-range, completely static analyses has been made obvious by the recent many-fold increases in stumpage prices and costs and in some localities by almost complete changes in markets. Furthermore, such change is now generally accepted as the rule rather than the exception. As a result, much greater emphasis is being placed on developing guides for short-run decisions.

Taking economic analysis in all-aged management as an example, foresters first were interested in what could be paid for a given stand considering current prices and the long-run productive capacity of the forest. But during recent years foresters have been more interested in determining optimum levels of growing stock. And currently we are interested in even shorter-term and more dynamic problems, such as how fast we should seek to approach such optima, considering present stand conditions, etc. Thus the "optimum growing stock" we are interested in is that for the next cutting cycle, which is to a large extent determined by the growing stock now present.

In even-aged management we are still interested in how much wood will be grown during the next 40 or 60 years if we plant a given species on a given site. But more recently interest has been shown in how production from currently immature stands can be increased—how future growth will be affected by the removal of various volumes currently, for example. Or how the yields from present stands can be increased by closer utilization, not only in the

woods and at the plant but by using the by-products of other wood-using industries.

The trend toward shorter-term analyses has emphasized a rather important characteristic of forestry production costs, viz., the low proportion of variable to total costs over periods covering only a few years. Variable costs as contrasted to fixed costs, are those which vary with the volume of production during the period of time under consideration. In analyzing alternatives from an economic standpoint we are concerned only with those costs which will affect future production, viz., variable costs. As the period of analysis becomes shorter, a smaller proportion of production costs fall within this category.

For example, in even-aged management once a mature stand has been harvested almost all costs for the next rotation are variable, since without any expenditure or financial sacrifice no production will be achieved. Planting and all protection costs for the entire rotation fall in the variable-cost category, as we can vary them without limit (and thereby vary yields). But as the stand reaches age 15, for example, all costs already incurred for insect or disease eradication, fire suppression, cleanings, plantings, etc., have become fixed costs, and as such no longer enter our analysis of alternatives. Because they are now completely unchangeable and can no longer affect production further, they can be ignored in future analyses pertaining to this rotation[2] (even though these costs remain "on the books").

Determining optima.—Even as early studies sought "yes-or-no" answers (Should we buy? Should we thin?), current interest lies more with problems of "where," "how," and "how much." These problems involve the determination of an optimum allocation of a given firm's production resources (*5, 8, 14*). Both teaching and research activities have reflected this interest. Improved techniques of analysis have been provided as well as more accurate and suitable biological data which may be adapted by individual firms to their own circumstances.

Twenty or so years ago it was useful to know that forty cords of southern pine per acre were grown in thirty years on plots given one treatment, as compared with only 20 cords from nearby "understocked" plots. But such data are no longer adequate. Research today must tell the forest manager qualitatively and quantitatively how growth is affected by species, age, site, stocking, etc. The effect of these and other factors on costs must also be evaluated.

By studying actual changes in growth, income, or costs associated with successive small changes in one or more factors that are subject to managerial control, the nature of the relationship and its implications are likely to be clearer than if average or total magnitudes are used. Analysis of multi-variable relationships is also simplified by such an approach. Essentially this is marginal analysis. Long a familiar tool in economics research, extensive formal use in forestry has developed only recently as we have sought answers to our where, how, and how-much questions in forest production.

Appraising alternatives. — In one sense the objective of almost any economic analysis in management is to discover the effect of various managerial alternatives on prospective costs and returns. But some analyses are more clearly concerned with well defined alternatives than others. Early forest economists referred to such studies as "statics" or "comparative valuation." But some of the long-range methods of analysis used in traditional valuation calculations were inappropriate, and apparently retarded developments in this field.

Indifference analysis is one accepted analytical tool of economics for comparing alternatives. Gregory (*7*) recently clearly demonstrated the simplicity and usefulness of this device for such problems as evaluating net benefits in the multiple use of our public forests.

The work of the Southern Forest Experiment Station on financial maturity exemplifies current economic analysis in that the method uses short-term criteria to evaluate the cut-or-leave alternatives in all-aged management. Other alternatives appropriate for appraisal in economic analysis are problems of where, when, and how much type conversion, planting, protection, utilization, etc.

Future over past.—Emphasis is increasingly pointed to future prospects rather than historical facts. With considerable early emphasis on accounting, and the associated recording of costs and incomes, a natural tendency in seeking guides to future actions was figuratively to look back over one's shoulder at past results as recorded in the bookkeeper's accounts. Thus some early and even recent writings have given considerable attention to such matters as cost value, "accumulation" of imputed interest, timber investment as a stumpage-price- influencing factor, and actual investment as a rotation-influencing factor. Such fixed-cost discussions are irrelevant in economic analysis.

Research publications have also been seriously guilty of drawing conclusions about optimum practices in the future from "over-the-shoulder" glances at history. For example, publications often point out the rate of return earned on forest plantings of the early 1930's (or some other date) and imply that such earnings would be likely on current plantings, without analyzing probable cost and price differences between the two periods.

That part of accounting commonly referred to as bookkeeping is still essential, as income taxes must still be paid and investors still require periodic brief descriptions of the status of their investment, even though such descriptions are admittedly and necessarily

[2] These are "short-run" analyses. That is, they cover a span of time so short that some inputs cannot be varied, and consequently the return to these factors is a cost which will not be related to production during that time period. All "sunk costs" are obviously in this category.

somewhat distorted. However, bookkeeping records cannot and should not be expected to serve as a very useful guide to future action in forestry. Thus bookkeeping is not of major importance in economic analysis.

Other activities in the field of modern accounting are an integral part of the economics of management, i.e., of economic analysis. For example, accountants in other industries have developed systems of standard costs which are useful in measuring efficiency. Such systems might prove very useful guides for measuring efficiency in the performance of specific tasks in forestry—to indicate whether logging, thinning, planting or other operations have been performed efficiently and in the most effective manner, but not to analyze whether they should have been performed. Sound planning also requires a good system of cost accounting. Such is required to maintain optimum utilization practices as prices fluctuate or variations occur in the availability of raw material for integrated conversion facilities. Thus even in accounting, those phases which are important to economic analyses are those that are future-facing rather than historical in outlook.

Economic Analysis and Some Traditional Problems

The altered emphasis in managerial economics has thrown new light on traditional topics for discussion among forest managers and economists. The examples that follow are illustrative.

Stumpage appraisal.—Described by Chapman (*2*) as one of the new emphases of American as compared with European valuation, interest in the techniques followed by the U. S. Forest Service in subtracting costs of conversion from primary-product price to determine "stumpage price" has recently declined. Somehow practicing foresters have misinterpreted the meaning of the resulting residual figure. Frequently this calculated residual has been referred to as what should be charged, a fair price, or even the value of the timber to the stumpage owner, when actually it is none of these.

Economic analysis places more emphasis on knowledge, recent prices, and future cost and price prospects as the major factors determining a seller's asking price. Stumpage appraisal from the buyer's viewpoint has also been slightly modified by stressing short-run analysis and "conversion-surplus" determinations. But a knowledge of conversion surplus alone is of little value to a purchaser. Not until combined with reliable data on factors such as market prices and the availability and cost of raw material from alternative sources, do conversion surplus data provide a sound basis for a stumpage procurement program.

Thus although techniques of stumpage appraisal remain important in economic analysis, they are considered more as a detail, with primary emphasis being placed on the overall problems associated with the applications of such information.

Forest rent, soil rent, and financial maturity.—Over one-hundred years ago Faustman first recommended an economic determination of optimum rotation age that ignored the value of the timber investment (Thomson, *12*). This became known as the rotation of "maximum forest rent" and was designed to maximize net annual income (forest rent) without regard to associated investment. Until recently discussions of economic optima for rotations centered about the advisability of this alternative as compared with the rotation which would maximize return on investment (maximum soil rent). Both concepts were based on a completely static type of analysis. In establishing a system of growing-stock regulation, the manager was supposed to appraise managerial costs, growth, and product prices. Based on such data he was to determine the optimum rotation according to one of these two criteria. But in either case the rotation selected would yield maximum returns as specified only if conditions remained unchanged over the entire rotation! Not even the most talented and confident crystal-ball-reading gypsies (or economists) claim such accuracy.

Typical of present trends in economic analysis is an alternative approach, that of financial maturity as demonstrated by Guttenberg and Putnam (*9*) and others. A new element introduced by financial maturity is the determination of "rotation" entirely on the basis of short-term considerations, with no reference "over-the-shoulder" to past costs. The prospective increase in each tree's value due to growth during the next few years is compared with the prospective additional costs of growing the tree for that time period. Interest on the tree's present market value or conversion surplus (not on actual book investment) is an included cost. In terms of economic analysis, the soil-rent-rotation calculation differs from that of financial maturity only in the time period considered — a long-run (full rotation or longer) calculation in the former and a short-run (few years) determination in the latter.[3]

Accounting and management.—That accounting techniques can be an invaluable asset to management seems clear. And equally clear seems to be the negligible value in economic analysis of data on historical costs and returns that have been recorded in a manner designed to fulfill income-tax regulations, to minimize taxes, or to satisfy standard bookkeeping requirements in businesses with distinctly different production processes. Rowbury (*11*) and others have proposed new bookkeeping methods

[3]Worrell (*13*) has recommended a rotation that would maximize the "internal rate of return," which Boulding (*1*) has defined as that which will "maximize the rate of growth in the value of the enterprise." If book investment is used as the value of the enterprise, this result is essentially the soil-rent calculation. And if the value of the enterprise is determined by market value or conversion surplus, the method is essentially identical to that of financial maturity. Harald Dickson's (*4*) analysis of the internal rate of return and European optimum-rotation concepts shows the effect of changing costs and prices on such calculations, but the analysis is based on book values and remains essentially long-run and static.

that are more appropriate to forestry. But providing foresters with a better knowledge of accounting vocabulary and techniques would seem to be simpler and more likely of success. Forest managers could then distinguish between "bookkeeping" activities and those accounting methods that are useful to him. He would do well to leave the former entirely to accountants, but to obtain all the help possible from accountants in developing useful techniques of control and efficiency analysis. Forest managers thus would dissolve the language barrier that separates them from accounting departments. This in turn would enable accounting and woodlands' departments jointly to present a clearer and more convincing picture of forest investment opportunities to top management.

Attempts by foresters to tell accountants how to set up books and keep historical records have met with a notorious lack of success. And few foresters wish to become accountants or bookkeepers. Thus it would seem most practical to recognize both groups as specialists, but to establish enough common ground between these two professional groups so that each may assist the other. An added advantage of this approach is that it should help remove one of the major causes of confusion in the analytical thinking of forest managers. It should help distinguish problems of bookkeeping (the accountant's field, to which foresters may be able to make a small contribution) from those appropriate to economic analysis (the forest manager's field, to which accountants can make very valuable contributions but in which they normally do not qualify for leadership).

The seemingly endless discussion over the validity of using compound interest in forest management is a good example of the confusion existing at least partly because of our failure to distinguish between bookkeeping and economic analysis. Little has been altered by the arguments. In economic analysis compound-interest calculations remain the primary time-weighing device when comparing alternatives in which incomes or incomes and costs are separated by a time interval longer than a single year. And the accepted bookkeeping practice remains not to record imputed interest or other opportunity costs.[4] Thus in historical records imputed or compound interest is omitted, but in looking forward and apprising current and future alternatives, compound interest is a useful tool of analysis.

Dr. Markus' interesting discussion concerning stand-establishment costs (JOURNAL OF FORESTRY, this issue) is a good example of the difficulties which arise from an attempt to synthesize accounting and economic analysis. Dr. Markus is concerned over whether costs of reestablishing stands should be charged against the stand about to be harvested or the stand to be established (and thus harvested R years hence). The discussion is typical of many which have appeared in forestry literature during the last forty years. The analysis is long-term (several rotations) and static, i.e., it assumes that all future establishment methods and costs will be identical. Confusion is indicated concerning the purpose of the cost allocation. Is the question one of bookkeeping, viz, should establishment costs be expensed or capitalized? Or is it one of analysis, e.g., how should this stand be regenerated?

If the question is one of economic analysis, relating reestablishment costs to the value of the stumpage about to be harvested is rather pointless. For, how does the value of the present mature stand help the manager decide whether to seek natural regeneration or to plant? And if planting is accepted policy, what does this year's income tell him about the best species to plant, the amount of site preparation to undertake, the appropriate spacing, etc? Does the absolute amount of income from cutting in a badly depleted stand of low-grade hardwoods in North Carolina provide the pulp-company owner any indication concerning the profitability of various type-conversion alternatives, some of which may cost more than the total amount of current income from that tract? All such questions require some form of economic solution, but in each case current income is irrelevant except as it affects the owner's current tax or liquidity status in a major way.

If Markus' and Ostwald's proposal is not valid in economic analysis, is it useful in bookkeeping? If the Internal Revenue Service were willing to accept the expensing of all reestablishment costs or if accountants found it useful to write off such costs against current income in records kept for other-than-tax purposes, the proposal could be readily adopted. But since imputed or "compound" interest is not a bookkeeping entry, the major objective of Ostwald's argument is lost. Here then is an example of fruitless argument because bookkeeping considerations were inserted into a problem of economic analysis.

Implications

Major interest in contemporary forest-management economics, herein referred to as *economic analysis*, has been placed on the development and use of techniques for evaluating alternatives and selecting optima based on short-term considerations. Because actual alternatives are concerned only with what we have today or may have tomorrow, bookkeeping and similar tools that deal with the past have little use in economic analysis.

Contrary to the assumptions of certain older analytical techniques,

[4] Imputed interest is interest an investor believes he could earn in some alternative investment—or that which he feels he should be earning in his present investment. An opportunity cost is the return any factor of production could earn in its next most productive use. Like imputed interest, it is a theoretical cost because no actual payment is made. But opportunity costs are important in decisions concerning the optimum use of available factors of production, because if returns are not greater than the sum of all variable costs, including all opportunity costs, the net return would be greater if all factors were transferred to these other uses.

our forest economy is a dynamic one. Management and its analytical tools must also be dynamic and adapted to change. Knowledge concerning optimum growing stock over a full range of theoretical volumes and conditions is useful. But we may select an optimum growing stock today and start toward it, knowing full well that before we achieve it the optimum itself will have changed. If we admit we will always be approaching, rather than operating at optimum conditions, then the major problem becomes selecting one of several alternative approaches toward that optimum. Such analyses require data not only on the effect, for example, of stocking on growth, but the effect of changes in stocking on growth. Thus intermediate results from many of our long-range studies (e.g., compartment studies) may be as important as the long-range results themselves. Improved techniques for recording and presenting such complex data will also be needed.

Private landowners must seek additional biological information for such analyses from our research institutions. But they must not expect final answers concerning optima and most profitable alternatives. Individual managers must be able to handle the analytical tools themselves and be willing to combine the cost, price, and organizational data pertinent to their company with biological data from research agencies. Management is asking more difficult questions—their solution cannot be expected to be simple.

In forest-management education, emphasis should be placed on understanding various techniques of alternative analysis and their possible applications. The forestry student should also be introduced to the functions and some of the techniques and language of accounting, with stress on cost-accounting and other techniques with "forward-looking" applications.

Better guides for determining optimum forest conditions are needed. But forest managers will be aided even more by improved knowledge and techniques to help him decide how and when to cut or treat the understocked and "imperfect" stands he now has. Research and teaching activities might well be oriented more directly toward providing improved data and analytical methods for solving these problems.

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Spruce Budworm Fought on Half Million Acres

Infestation of spruce budworm (*Choristoneura fumiferana* [Clem.]), mostly on the Boise, Challis, Payette, and Salmon National Forests in Idaho are being fought during the summer of 1956 by aerial application of insecticides on a total of 452,000 acres. Spraying, begun in late June, was expected to be completed by early August. Cooperating with the U. S. Forest Service in the undertaking are representatives of the organizations which comprise the South Idaho Pest Action Committee: State of Idaho Department of Forestry and Land Department, the Keep Idaho Green Committee, the Southern Idaho Forestry Assn., the South Idaho Lumber Industry, the Western Pine Assn., and the Bureau of Land Management.

The spruce budworm attacks Douglas-fir, true fir, and spruce, preferring the two former species. Spray concentrations used do not destroy parasites of the budworm and have never been shown to result in serious damage of wildlife or domestic animals. The area to be treated supports 3.65 billion board feet of timber with an estimated stumpage value of $10,950,000.

Twenty-Five-Year Summary of Red Pine Thinning Plots: Cloquet Experimental Forest[1]

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THIS is the sixth report on four thinning plots established in 1927. For convenience all the basic data previously reported (*3,4,5,6,7*) are included in this twenty-five year report.

The 80-year-old virgin red pine on this area was cut during the heavy seed year of 1911 just as the Cloquet Experimental Forest was being established. Cutting was supervised by the Indian Service and all slash was piled and burned as logging progressed. The volume of the original stand was about 15,000 board feet per acre. The area where the thinning plots are located was cut over in the fall just as the cones were opening. The position of the undercuts on old stumps indicates that the dense areas of reproduction occur where the tops of several trees overlapped when felled. This accounts in part for the great variation in density of the young stand.

At the time of thinning in 1927, the stand was 15 years old and heavily overstocked. The total number of trees per acre including all trees one foot and over ranged from 13,140 to 20,780 on the tenth-acre plots and the average height from 3.5 to 4.4 feet (Table 1). In marking for thinning, an attempt was made to obtain average spacings of 4, 6, 7, and 9 feet. The plots have since been left unthinned in order to determine when the growth rate declines and how much volume is lost by not thinning the various spacings. An unthinned control plot was established in 1937, the original check plot having been accidentally destroyed in 1934.

Stand Data

Measurements at 5-year intervals from 1927 to 1952 are summarized in Table 2. The left-hand columns record the actual measurements made from 1927 through 1952. The right-hand columns record the differences between each adjacent 5-year periods. They thus show in detail the periodic changes in the plots, basal area, average diameter, and average height. These changes may be termed *net growth*. It should be borne in mind, however, that these net-growth figures apply to the entire plot and not to the individual trees. For example, the net increase in average diameter of the plot will be greater than that of the living individual trees because the mortality of small trees during the period increases the average diameter of the plot even if no growth takes place. Again the current average height growth of the dominant trees may not differ significantly between the plots. That the average height growth for the 4 by 4 plot is smaller than that for the 9 by 9 plot, may well be due only to the larger proportion of intermediate and suppressed trees in the former plot.

Volumes were computed for the first time in 1947 and again in 1952 (Table 3).

Results

During the 1947-52 period, the check plot lost 920 trees per acre which had the effect of increasing the spacing from 3.4 to 4.1 square feet. Losses of 20 trees per acre in the 6 by 6 plot and 10 trees per acre in the 7 by 7 plot did not materially alter the spacing of 1947. The 9 by 9 plot lost no trees during the 1947-52 period. The loss of 280 trees per acre in the 4 by 4 plot indicates that competition is beginning to intensify in this plot and that probably another thinning should be undertaken.

For all the plots the diameter growth was less during the 1947-52 period than in the previous periods. This may mean that the first very rapid diameter growth of young trees is past and that the trees are beginning to slow up a bit, or weather conditions may not have been as favorable for growth during the period from 1947-52. The check and the 4 by 4 plot have about the same rate of diameter growth, which is to be expected since they have nearly the same spacing. There seems to be a direct relationship between the density of the stand and diameter growth.

Table 2 also gives the height-growth data for the 25 years since establishment. In the early years all heights were measured by placing a graduated rod beside each tree. In 1952, however, it was necessary to use a hypsometer. During the 1947-52 period, height growth was uniform for all plots except the 9 by 9 spacing where height growth was larger. During the

[1]Published as Scientific Journal Series Paper No. 3509 of the Minnesota Agricultural Experiment Station.

TABLE 1.—TREATMENT DATA 1927
(Per acre basis)

Desired spacing	Before thinning	Removed	After thinning	No. with d.b.h. 1 in. and over	Average height Before thinning	Average height After thinning
Feet	*Total no. of trees*				*Feet*	
4 by 4	20,780	18,140	2,640	260	3.8	6.0
6 by 6	15,020	13,490	1,530	700	4.1	7.7
7 by 7	13,140	12,260	800	140	4.4	6.8
9 by 9	20,180	19,610	570	60	3.5	5.7

1947-52 period height growth was less than the previous 5-year period. It is difficult to account for this, but it might be due to less favorable weather conditions because precipitation during the growing season was deficient in 1946. Since 1946-47 were in the previous 5-year period, the cumulative effect of the deficiency might not have become evident until the 1947-52 period.

Volumes were computed in 1947 and again in 1952 using a volume table for second-growth red pine compiled by Gevorkiantz (*1*). All volumes are "peeled volumes" and the merchantable volumes are computed to a 3-inch top diameter with a one-foot stump, the results are given in Table 3A and 3B. The periodic annual growth of 1.8 cords per acre for the 7 by 7 and 9 by 9 spacing is an excellent growth rate. That this is a thrifty stand is shown by the fact that even the check plot has a periodic annual growth of one cord per acre per year. There seems to be a direct relationship between the degree of thinning and the periodic volume increase since the growth rate increases with the severity of thinning.

It appears that the 9 by 9 spacing is catching up and may in time actually surpass the other spacings in growth rate.

Discussion

When these plots are compared with the normal yield table for unmanaged red pine stands by Eyre and Zehngraff (*2*) we find that at forty years the check plot has more trees than a normal 20-year-old stand, the 4 by 4 plot the number of trees for a normal 22 year-old stand, the 6 by 6 plot the number for a 27 year-old stand, the 7 by 7 the number for a 35 year-old stand, and the 9 by 9 the number for a 48-year-old stand. The number of trees would indicate a need for additional thinning in all but the 9 by 9 plot.

Basal areas are high compared to the yield tables for all the plots except the 9 by 9 plot, which has a basal area of 121.7 square feet, the normal for a 35-year-old stand. The check plot and the 7 by 7 plot have the basal area of a 95-year-old stand, the 4 by 4 and 6 by 6 plots have a basal area greater than a 160-year-old stand, while the 9 by 9 plot has the basal area of a 35 year-old stand.

The yield table gives a merchantable yield of 1,550 cubic feet per acre in trees five inches and over,

TABLE 2.—PLOT STATISTICS AFTER THINNING
(Per acre basis)

Plot	Year of measurement 1927	1932	1937	1942	1947	1952	Periodic development 1927-1932	1932-1937	1937-1942	1942-1947	1947-1952
					Total number of trees[1]						
									Mortality		
Check	.....	.....	4820	4240	3420	2500	.....	.....	–580	–820	–920
4 by 4	2640	2610	2510	2510	2410	2130	–30	–100	0	–100	–280
6 by 6	1530	1510	1500	1500	1490	1430	–20	– 10	0	– 10	– 60
7 by 7	880	840	840	830	830	820	–40	– 10	0	0	– 10
9 by 9	570	530	500	500	500	500	–40	– 30	0	0	0
					No. with d.b.h. 1-inch and over						
Check	.....	.....	4060	3840	3400	2500	.....	.....	–220	–440	–900
4 by 4	260	2250	2460	2460	2410	2130	1990	210	0	– 50	–280
6 by 6	710	1500	1500	1500	1450	1430	790	0	0	– 50	– 20
7 by 7	140	810	830	830	830	820	670	20	0	0	– 10
9 by 9	60	430	500	500	500	500	370	70	0	0	0
					Basal area (Square feet)[1]						
Check	.....	.....	97.3	126.9	158.6	170.2	.....	.....	29.6	31.7	11.6
4 by 4	2.5	38.6	87.9	135.0	175.5	203.2	36.1	49.3	47.1	40.5	27.7
6 by 6	6.0	39.1	85.2	137.4	178.3	203.5	33.1	46.1	52.2	40.9	25.2
7 by 7	1.6	19.6	50.5	92.1	139.5	170.8	18.0	30.9	41.6	47.4	31.3
9 by 9	0.5	6.3	19.7	47.3	86.4	121.7	5.8	13.4	27.6	39.1	35.3
					Average d.b.h. (Inches)[1]						
Check	.....	.....	2.05	2.46	2.92	3.21	.....	.....	0.41	0.46	0.29
4 by 4	1.33	1.77	2.55	3.11	3.63	3.95	0.44	0.78	0.56	0.52	0.32
6 by 6	1.25	2.27	3.21	4.10	4.73	5.10	1.02	0.94	0.89	0.58	0.37
7 by 7	1.42	2.11	3.33	4.48	5.52	6.02	0.69	1.22	1.15	1.04	0.50
9 by 9	1.27	1.63	2.69	4.18	5.63	6.57	0.36	1.06	1.49	1.45	0.94
					Average height (Feet)[2]						
Check	.....	10.4	14.6	18.1	24.1	29.4	.....	4.2	3.5	6.0	5.3
4 by 4	6.0	11.2	16.3	20.9	28.0	33.3	5.2	5.1	4.6	7.1	5.3
6 by 6	7.7	12.5	19.3	25.8	33.2	37.9	4.8	6.8	6.5	7.4	4.7
7 by 7	6.8	11.0	16.8	23.5	31.2	36.8	4.2	5.8	6.7	7.7	5.6
9 by 9	5.7	8.5	12.8	19.7	27.7	35.2	2.8	4.3	6.9	8.0	7.5

[1]Trees 1.0 in. and over.
[2]All trees.

TABLE 3A.—VOLUME AND GROWTH

Plot	Total	Merchantable[1]			Mean annual growth Total	Merchantable[1]	
	1947 volume per acre						
	Cu. ft.	*Cu. ft.*	*Percent*	*Cords*[2]	*Cu. ft.*	*Cu. ft.*	*Cords*[2]
Check	1,993	718	36	8.0	57	21	0.23
4 by 4	2,294	1,180	51	13.1	66	34	.37
6 by 6	2,587	1,976	76	22.0	74	56	.63
7 by 7	1,897	1,519	80	16.9	54	43	.48
9 by 9	1,029	820	80	9.1	29	23	.26
	1952 volume per acre						
Check	2,417	1,177	49	13.1	60	29	0.37
4 by 4	3,076	1,708	56	19.0	77	43	0.54
6 by 6	3,327	2,608	78	29.0	83	65	0.83
7 by 7	2,707	2,331	86	25.9	68	58	0.74
9 by 9	1,797	1,608	89	17.9	45	40	0.51

[1]Utilization limits 1 ft. stump to 3 in. top.
[2]90 cubic feet per cord.

TABLE 3B.—PERIODIC ANNUAL GROWTH 1947-52

	Total	Merchantable[1]	
	Cu. ft.	*Cu. ft.*	*Cords*[2]
Check	85	92	1.0
4 by 4	156	106	1.2
6 by 6	148	126	1.4
7 by 7	162	162	1.8
9 by 9	154	158	1.8

[1]Utilization limits 1 ft. stump to 3 in. top.
[2]90 cubic feet per cord.

TABLE 4.—STATISTICS FOR 200 FINAL CROP TREES
(Per acre basis)

Plot	Ave. d.b.h. inches 1947	1952	Ave. increase 1947-52	Basal area sq. ft./acre 1947	1952	Periodic increase 1947-52	Ave. ht. feet 1947	1952	Increase 1947-52	Merch. vol. cu. ft. 1947	1952	Periodic increase 1947-52	Percent of total vol. that is merch. 1947	1952	Cords 1947	1952	Growth 1947-52
Check	4.5	5.3	0.8	22.82	30.54	7.72	31	37	6	224.8	388.8	164.0	31	33	2.5	4.3	1.8
4 x 4	5.6	6.1	0.5	33.75	41.00	7.25	34	39	5	419.9	562.0	142.1	36	33	4.7	6.2	1.5
6 x 6	6.2	6.8	0.6	41.61	50.24	8.63	37	43	6	541.6	780.4	238.8	27	30	6.0	8.7	2.7
7 x 7	6.9	7.8	0.9	52.55	67.47	14.92	36	42	6	697.0	1045.2	348.2	46	45	7.7	11.6	3.9
9 x 9	6.5	7.7	1.2	46.20	65.16	18.96	30	38	8	523.1	920.4	397.3	64	57	5.8	10.2	4.4

or 22 cords. The 6 by 6 plot with a merchantable volume of 29 cords exceeds the normal by 7 cords, the 7 by 7 plot exceeds the normal by 4 cords. All the rest of the plots are below normal with the check plot making the poorest showing with 13 cords per acre.

The yield table indicates that in well stocked, unmanaged red pine, on an average site, there should be 200 trees per acre at 120 years. These may be termed final crop trees. It is interesting to see how these final crop trees have grown during the past 5-year period. These trees are dominants and in theory, at least, are making full use of the site. Table 4 gives the data for these trees on a per acre basis. There seems to be a direct relationship between the degree of thinning and the average diameter and height of the 200 final crop trees. The heavier the thinning, the greater the diameter and height growth. This is, of course, reflected in an increased volume growth. The final crop trees in the check plot increased in volume 1.8 cords during the 1947-52 period, while in the 9 by 9 plot they increased 4.4 cords, more than twice the increase of the check plot. In 1947 the percent of the stand merchantable volume contained in the final crop trees varied from 31 percent in the check plot to 64 percent in the 9 by 9 plot. In 1952 it varied from 30 percent in the 6 by 6 plot to 57 percent in the 9 by 9 plot. This would seem to indicate a more rapid growth rate for all trees in the heavily thinned stands than in the lightly thinned.

The results at this time indicate that red pine stands with a density of 1,400 trees per acre definitely begin to show some stagnation at 40 years of age. Stand densities of 500 to 800 trees per acre are still accelerating in growth at 40 years of age. Thinning does seem to have a stimulating effect on the growth rate of even the dominant trees.

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New Attack Against the Gypsy Moth Begins

Intensive control measures against the gypsy moth have been taken in parts of New York, New Jersey, and Pennsylvania.

Through the joint efforts of the Agricultural Research Service and the states of New Jersey, New York, and Pennsylvania, some 500,000 acres in a 90-mile strip have been sprayed from the air with DDT during June to eliminate the insect. The strip extends about five miles on either side of the New York-New Jersey border and continues into Pike County, Pa., and the adjacent area of New York. It reaches north on the New York side of the Delaware River into Sullivan County, N. Y. The strip being sprayed constitutes a protective border along the southwestern edge of the area newly infested by the gypsy moth during the past two years.

Congress has appropriated more than $300,000 for federal participatin in combating the moth along the strip. In addition, cooperative work is continuing in central and eastern New England, where the pest has been found for many years, and a spot infestation near Lansing, Mich., was sprayed earlier this year.

Southeast Hardwood Distribution from Stump to User[1]

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HARDWOODS account for from 20 to 25 percent of the lumber manufactured in the United States. Fifty percent of this production is from the South. Comparative importance of hardwood production for a three-state area is shown in Table 1.

In the southeastern states much of the hardwood log production is consumed by local industry. The postwar establishment of end product plants and a local housing boom have made it possible to sell a very large part of the regional production at home.

Besides the excellent markets in our producing area we continue to supply foreign and other domestic markets with hardwood lumber, logs, veneer, and plywood. However, postwar exports of hardwoods has been spotty. Our principal species, oak, is in competition with good oak from Japan and Yugoslavia. During 1955 only those producers with low barge or rail rates to Gulf ports were able to compete successfully for United Kingdom business. Appalachian producers were shut out entirely because former differentials for soft texture quality cannot be protected by present British import policy. Our dogwood and hickory still goes to Britain for the textile industry, and during the war, under Lend Lease, were responsible for the continued operation of that industry. Hickory blanks and logs go to Germany and the Scandinavian countries. Oak cross ties go to the Low Countries. South America, South Africa, Hawaii, and the Philippines continue to be small customers. But Canada buys more than all combined, principally oak.

Locally, we have substantial consumers of hardwoods. Large quantities are used by flooring plants, furniture plants, railroads, shipbuilders, container plants, pallet plants, and hardwood paneling plants. In addition there are numerous specialty manufacturers, including baseball bat manufacturers, agricultural implement manufacturers, and small dimension and glued-up dimension manufacturers.

The Southeast is ringed on the North and East by flooring, furniture, and container manufacturers in Tennessee, Kentucky, and the Carolinas who buy substantial quantities of our hardwood lumber, logs, veneer, plywood, and core stock. We ship lumber to Indiana, Illinois, and southern Wisconsin and finished products such as flooring and plywood reach the Northeast in significant quantities. The West Coast is a steady outlet for No. 2 magnolia and thin oak flooring, but we must absorb freight in competition with mills west of the Mississippi River to satisfy a significant portion of the West Coast demand for high grade oak and ash.

Distribution Patterns

The first "sort" in the woods starts a pattern. In the ideal case we have veneer logs as well as sawlogs, but white oak logs for veneer are rare though the tight cooperate market and the export demand for ship timber logs compete with high grade lumber production. In north Georgia we produce locust posts and dogwood billets. A former acid wood market for dead chestnut is presently dormant. We have an outlet for hickory logs for the production of highway brushes. Further south all the soft hardwood logs might go to container veneer instead of sawmills.

I am going to pass up the large stationary mills for a moment and discuss the small mill, portable or stationary, from which lumber is trucked, green, to a hardwood yard where it is stacked for drying and held for resale. Such a yard without any mill of its own is properly called a concentration yard, but few, if any, independent hardwood concentration yards exist today. They are generally owned by flooring plants. Many bandmills and large circular mills buy small mill lumber and stack it with their own, while a variation is to buy stumpage and have it cut at a contract rate. Flooring plants use most of the lumber they concentrate, and the remainder is sold in competition with that from the larger mills. Generally, the bandmills get better prices for lumber of the same species, grade, and thickness because they are able to furnish better lengths and widths, more uniform, better edged and trimmed lumber.

Sales of air-dry lumber are made by any of the foregoing direct to consuming plants or through a lumber wholesaler, or commission salesman. Wholesalers of hardwood lumber vary in type of operation but all have two things in common: they all serve as sales-

TABLE 1.—COMPARATIVE IMPORTANCE OF HARDWOOD PRODUCTION IN THREE SOUTHERN STATES IN 1952

State	M.b.m. softwood saw logs	M.b.m. hardwood saw logs	M.b.m. hardwood veneer logs	Hardwood percentage of total log production
Alabama	1,137,135	548,764	88,205	35.8
Florida	452,846	33,165	82,052	20.3
Georgia	1,655,800	506,373	147,140	28.3

[1]Presented at meeting of Southeast Section, S.A.F., Montgomery, Ala., Jan. 20, 1956.

men for hardwood lumber producers and they all take title to the lumber they handle. These functions are particularly important to the smaller hardwood producers who have no sales force and only limited contact with consumers. Some wholesalers buy lumber they never see from shippers they do not know, but can do so quite safely from well rated mills shipping cars with N.H.L.A. certificates attached. Other wholesalers carry a staff of capable lumber inspectors who ship out the lumber they buy. Others know their shippers even more intimately, financing their operations by payments for lumber in pile, balance at time of shipment. This latter pattern, once popular, is rare now. Wholesalers often buy from each other. It may happen that one has the customer and another the source for some unusual item like cypress tank stock, or a car of sassafras.

A hardwood commission salesman is in constant contact with the consuming trade but does not buy, does not take title to the product he sells. He is an important functionary in the overall distribution of hardwood lumber and other hardwood products. Only a relative handful of hardwood producers have full time salesmen of their own. The others must depend on hardwood wholesalers and commission salesmen to complement the sales solicitations of their own offices. Some wholesalers and commission men make exclusive arrangements to sell for a limited number of shippers. Others play the whole field.

The hardwood exporter is another distributor who continues to serve functions pretty much as he did before World War II. Such exporters buy from hardwood producers and wholesalers on a delivered port price, deal with steamship lines and forwarding agents, prepare consular bills of lading and maintain foreign contacts. Unlike wholesalers who base their price on F.O.B. mill value, the exporters use their cost delivered port as a basis for selling and add a selling commission on the same basis for their commission agent abroad who sells to the consumer.

Another important type of yard between the producer and the consumer is the wholesale distribution yard which is not really a yard but a system of sheds. Such yards may by kiln-dried lumber only or may buy air-dried lumber which they put through their own kilns. The hardwood distribution yard sells to small furniture plants, shipbuilders, small millwork plants, store fixture manufacturers, and cabinet shops. Such yards are especially necessary to adequately serve hardwood consumers in cities like Jacksonville and Miami, Florida, although they are found in all the major cities of the Southeast. These yards often serve as outlets for hardwood and softwood plywood, softwood uppers, stock millwork, and mouldings.

Thus far I have only covered the highlights of hardwood lumber distribution without attention to the bolts, billets, and logs used by hardwood manufacturers of products other than lumber. One of the most important of these is the manufacture of veneer. Some container plants manufacture their own veneer for use in wirebound crates or baskets and hampers. At least one of these plants is also licensed to manufacture craveneer, usually 1/6 or 1/8 veneer with outer plies of heavy Kraft paper. But the most important production of veneer is that of crossbanding and face veneer for plywood and furniture use. In addition to domestic species, principally gum and poplar, exotic species are veneered in the Southeast. Veneer distribution has changed less, perhaps, than any other hardwood product through the years. First a typical manufacturer produces sufficient veneer from logs chosen for uniformity to back up a sample line with truckload and carload shipments. Then he turns over his sample lines to commission veneer salesmen who often specialize in the sale of veneers to the exclusion of all other hardwood products. The earnings of these commission salesmen are a uniform 10 percent. In contrast we find hardwood lumber commission salesmen working for 3 to 5 percent.

Trends, Past and Current

The distribution of hardwoods is governed by what we may term the "ethics of survival" under continuously changing conditions. Every entity in the chain of distribution must continue to perform a necessary function in order to survive. Some distribution patterns have remained remarkably static through the years as, for instance, the movement of face veneers through commission veneer salesmen.

Similarly, we find cross ties concentrated at railroad points by large contractors and treating plants, the former often associated ated with the railroad. Switch ties are similarly concentrated, but many are also produced by bandmills who take cutting orders from off-line buyers. Most southern railroads are able to buy all their ties and timbers on-line but the northeastern roads must buy heavily off their own lines. There has been little change, too, in the distribution of the special small dimension products manufactured from hickory, dogwood, and ash or of rough furniture squares and broom and mop handle squares.

Our big change has materialized in the sale of hardwood items used in home construction. Increased use of truck transportation, easy money to finance home construction, fewer and shorter economic slumps, have all tended to bring the builder closer to the manufacturer.

The ethics of survival in the period between World Wars I and II demanded that the manufacturer sell only to retail lumber yards, or wholesale distribution yards or both. The latter type yard still exists in the Southeast but oak flooring has disappeared from its inventory everywhere except in Florida. Formerly, these yards performed such functions as stocking carload quantities of each grade of red and white oak floor-

ing and often maple flooring. Two functions were involved. The first was that of helping the producer to carry a selling inventory and the other was to ship out small lots to small retail yards whose owners could not afford to buy in carload lots. The need for these functions no longer exists in Georgia and Alabama. We now have so many flooring plants that few retail yard operators need travel over 100 miles to load a truck at the manufacturer's warehouse. There retail dealers meet building contractors buying at the same level. So the ethics of an earlier generation go by the boards. In prewar days the manufacturer protected the wholesale warehouse by refraining from direct sales to retail yards within the area served by the warehouse. Outside that area the manufacturer sold direct to the larger retail yards, or protected a wholesaler in doing so. They did not sell to contractors, and in that manner protected the distribution pattern between the manufacturer and the consumer. Since the need for many distribution functions has diminished, the conditions of survival have changed. The old patterns are more apparent as the distance from a production area increases. Inside a production area, such as the Southeast, the old patterns tend to disappear as direct sales, from manufacturer to consumer, increase.

Today's trends should continue as long as we continue to enjoy a high level of building and general prosperity.

E. T. Clark (1886-1956)

Elias T. Clark, 69, secretary-manager of the Pacific Northwest Loggers Association, died in June in Seattle, Wash.

Born in Woodbridge, Conn., September 1, 1886, he received the M.F. degree from Yale University in 1908. Following graduation he joined the U. S. Forest Service, rising to the position of deputy supervisor of the Snoqualmie National Forest in Washington.

In 1911 he organized courses in logging engineering at the University of Washington, and served on the faculty of the College of Forestry until 1927.

In that year he became superintending engineer and later manager of a group of logging companies. He was appointed secretary-manager of the Pacific Northwest Loggers Association in 1938, and served in that capacity until his death.

Mr. Clarke made numerous contributions to forestry. He was one of the founders of Xi Sigma Pi, national forestry honorary fraternity. For many years he was a director of the Pacific Logging Congress.

A member of the Society of American Foresters since 1911, he was chairman of the Puget Sound Section in 1942, and had been a member of the Society's Committee on Safety since 1951. Long active in promoting safety in the woods, he pioneered a safety training film that won national awards. He was the author of one book and numerous technical articles.

The Rust Fungus (Cronartium stalactiforme) In Lodgepole Pine

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WITH THE increasing demand for lodgepole pine (*Pinus contorta* Dougl.) timber, particularly for use as lumber, it is important that the diseases of this tree become better known. Recognition by foresters of pathogens attacking the tree is a requisite for satisfactory management of the species, especially in timber stand improvement. One of the diseases of lodgepole pine that is more prevalent in the Intermountain and Rocky Mountain Regions than is generally realized is a perennial canker caused by the rust *Cronartium stalactiforme* A. & K. The following information on this rust may aid in its recognition by foresters and others concerned with the lodgepole pine forests of the West.

Nomenclature, Hosts, and Range

For a number of years considerable confusion has existed in the literature on identity and nomenclature of the native rusts reported attacking lodgepole pine. The rust dealt with here fits the description of *Peridermium* (*Cronartium*) *stalactiforme* and is therefore considered a distinct species as originally described (*3*, *1*). It is not to be confused, as has often been the case, with typical *C. filamentosum* Peck. Furthermore, no positive evidence has yet been presented of this fungus attacking lodgepole pine, and its only known host at the present time is ponderosa pine (*Pinus ponderosa* Laws) (*7*, *8*). *C. stalactiforme* has also been confused with a gall rust usually referred to as *Peridermium* (*Cronartium*) *harknessii*. This organism is commonly associated with a type of lesion on the trunks of both lodgepole and ponderosa pines termed "hip canker." These relatively short cankers, which are as yet inadequately described in the literature, vary considerably in shape. This situation probably accounts for some of the confusion in the identity of the causal organism. The nomenclature became further confused when Arthur (*2*) proposed that the three rusts in question be regarded as the same species under the name *C. colesporioides* (D. & H.) Arth. However, when he adopted this view he conceded that they might be treated as distinct species or varieties. All three of these rusts have been reported as having Indian paintbrush (*Castilleja* spp.) and certain other closely related members of the Scrophulariaceae as alternate hosts (*2*).

Because of the above-mentioned confusion in identity and nomenclature that has existed for so many years, it is impossible to compile an accurate list either of the pine species attacked by *Cronartium stalactiforme* or of the alternate host plants. Lodgepole appears to be one of the most common pine hosts and Indian paintbrush (*Castilleja* spp.) probably the most common alternate host.

The past difficulties with identity and nomenclature also make it impossible to give a reasonably accurate range for this rust. Present evidence indicates that it is largely confined to the Pacific Coast and Rocky Mountain Regions.

Character of Attack on Lodgepole

Although *Cronartium stalactiforme* has been known in lodgepole pine since 1906 (*3*), the character of attack on this host by the pathogen has not been adequately described or illustrated in the literature. When this fungus was originally described it was reported merely as "on branches." In 1922, however, Arthur (*1*), in an amended description of the fungus on pines, mentioned that the aecia (spore sacs) occur on trunks and branches, also that they often extend over considerable areas of the bark and cause little or no swelling.

Meinecke (*5*, p. 282) briefly describes the attack as follows: "On *Pinus contorta* the infection of the stem takes place through small twigs and spreads very evenly up and down the trunk much faster than sideways. The result is a very neat elongated diamond." This is correct as to the method by which infections usually occur, also as to the shape of the cankers or lesions on trunks. However, the literature gives no information on the later development of the cankers, the sizes that they may reach on trunks, or sizes of affected lodgepole. No illustrations of cankered trunks typical of the fungus have been published.

In its vertical growth the fungus follows the grain of the wood and infected trees with spiral grain have spiral trunk cankers. In most cases there is a single trunk canker per tree, but two or three are occasionally found, and four or more are rather rare. Pines of all ages are affected. Cankers high on the trunks of large and old trees are common. Lateral enlargement or growth of the cankers is so slow that they rarely, if ever, girdle a tree. The average annual lateral growth rate is from about one-fourth to one-half inch. This growth is largely compensated for by the increased growth in circumference of the tree. Therefore girdling seldom occurs except when two or more cankers on a single trunk coalesce.

The vertical growth of *Cronartium stalactiforme* trunk cankers is

much more rapid than lateral growth and averages almost 7 inches per year. Measurements generally showed a greater average annual growth rate downward than upward. This same tendency has been reported for white pine blister rust cankers (*9, 4*). The largest cankers observed were between 25 and 30 feet long.

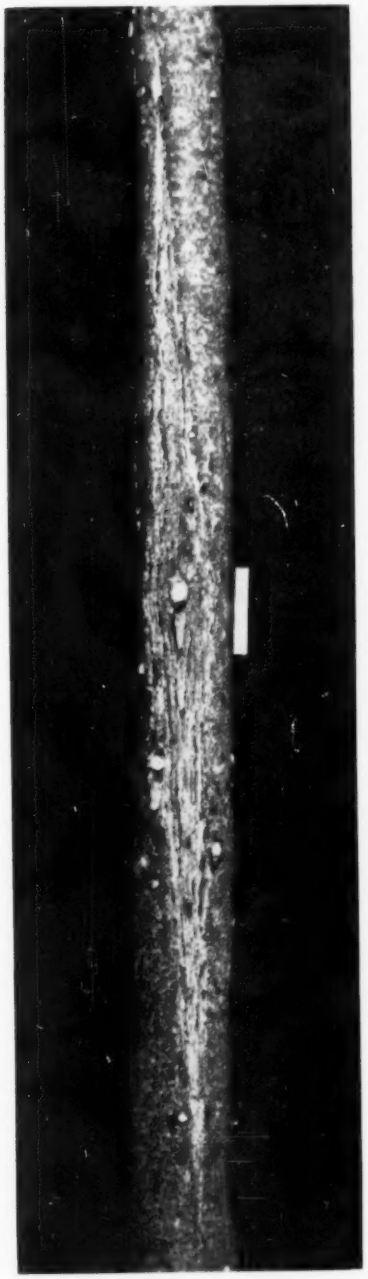

FIG. 1.—A typical *Cronartium stalactiforme* trunk canker on lodgepole pine. Rodents have annually removed portions of the infected bark. The canker has a slight spiral shape caused by the mycelium of the fungus following the grain of the wood.

Observations have been made on thousands of *Cronartium stalactiforme* branch and trunk cankers and, except for a few small ones on young trees, the writer has seen none that have not had zones of infected bark removed by rodents of some kind. Presumably this bark removal is done mainly by pine squirrels or chickarees (*Sciurus* spp.), which are common on these areas, and occurs in late winter and early spring when other food materials are scarce. This is not unusual because various rodents are known to feed on bark affected by other rusts, such as that of white pines infected with white pine blister rust (*C. ribicola* Fischer) (*6*). The invaded bark contains an abundance of the fungus mycelium and probably also an excess of starch, both of which apparently are quite palatable to these animals.

Rodents seldom remove all of the infected bark, as evidenced by the continued development of the fungus within the living bark tissues bordering the wounds. Branch infections, therefore, eventually invade the trunk, even though they are fed on by rodents. Once the infection is established in the trunk these animals feed annually on the cankers. The feeding, as mentioned above, takes place during the period from late winter to early spring. At that time diseased bark is removed that became invaded by the fungus the previous season. This procedure is repeated from year to year. Abundant resin exudation results from this bark removal.

A typical *Cronartium stalactiforme* trunk canker from which rodents have annually removed portions of the infected bark is shown in Fig. 1. Following bark removal by these animals the margins of the wounds dry out and become hardened. When the rodents feed upon the cankers the following year, the narrow margin of dry and hardened bark is not usually fed upon. Thus small ridges remain that become darker colored with age. These ridges of bark (Fig. 2) are characteristic and may serve to distinguish rust cankers from other rodent feeding on healthy bark.

FIG. 2.—A portion of a *Cronartium stalactiforme* trunk canker on lodgepole pine showing evidence of annual visitation by rodents that have fed on the diseased bark. This is indicated by the irregular dark-colored lines which are ridges of hardened bark.

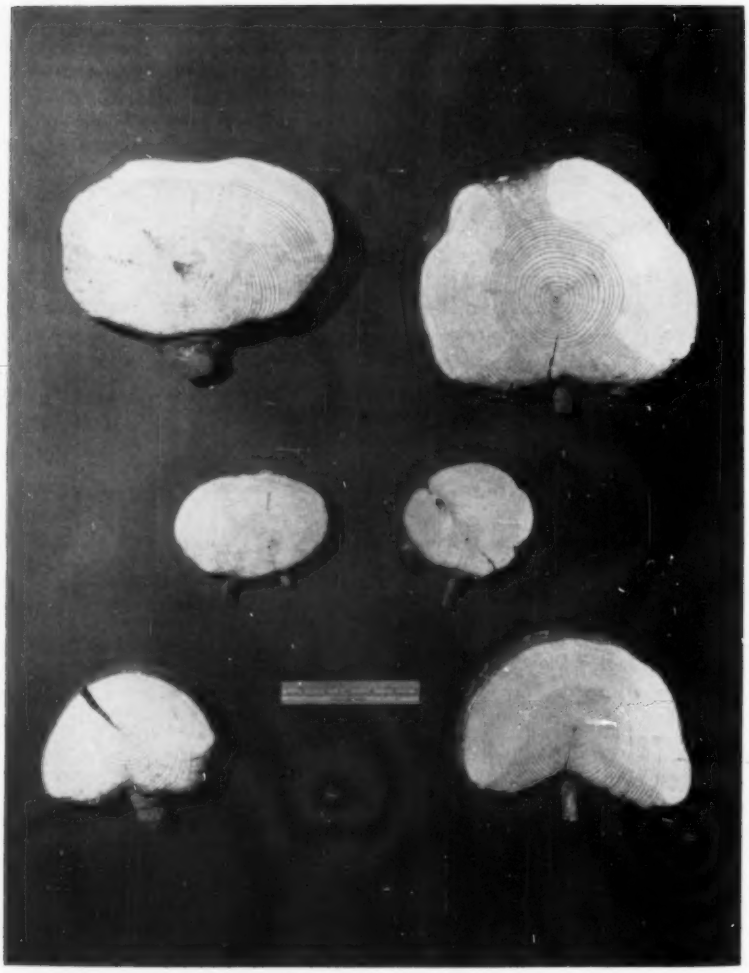

FIG. 3.—Eccentric growth of the trunks of six lodgepole pines caused by the rust *Cronartium stalactiforme*. These transverse sections were taken from the central portion of each canker. Season checks developed after the sections were removed from the trees.

As mentioned earlier, all *C. stalactiforme* trunk cankers seen, except for a few small ones on seedlings, bore evidence of bark removal by rodents. For this reason it is not known what the appearance would be of a normal or uninjured canker on older trees.

A total of 21 diseased lodgepole pines, ranging from 4.2 to 13.2 inches d.b.h., and averaging 8.7 inches, were felled for examination.[1] These trees bore a total of 27 trunk cankers. A thin transverse section of trunk was removed with a saw from the oldest portion of each canker. The central or oldest portion of a canker was easily determined in practically all cases because the branch from which the infection entered the trunk was usually present and almost invariably shows evidence of bark removal by rodents. Examination of the transverse sections showed that, because of the bark removal, a segment of each annual ring on a trunk is missing from the cankered area (Fig. 3). The oldest portion of a canker may also be determined by noting the oldest ring that has been scarred by rodents and thus has a segment missing. For each transverse section careful counts were made of the number of growth rings from the pith to the opposite or uninjured side of the trunk. The difference in the number of rings shown by the two counts was regarded as the age of the canker on the trunk or number of years that the trunk has been infected.

The youngest trunk canker studied was 5 years of age and the oldest one 39 years. The latter was 23.4 feet in length. Fourteen of the 27 cankers studied measured over 10 feet in length. Of the total of 27 cankers, 4 were less than 10 years old, 11 were from 10 to 19 years, 10 were from 20 to 29, and 2 were from 30 to 39 years old. While the cankers on the trunks fall within these age groups, the infections which caused them may be much older. This results because the initial infection of the trees took place through small twigs and a number of years elapsed before the mycelium of the fungus reached the trunk via a branch.

Because all of the diseased bark is not removed from the outer margins of the cankers, a few scattered aecia are usually produced each spring along the margins. The very sparse production of this spore stage probably is responsible for the fact that the presence of the fungus has generally remained undetected and consequently has not been recognized as the primary factor leading to the removal of the bark. Aecia and aeciospores taken from the margins of several cankers were found to compare in all details with the rust described as *Cronartium stalactiforme*.[2] A portion of this collection of aecial material was used, under controlled greenhouse conditions, to successfully infect six potted plants of *Castilleja rhexifolia* Rybd., on which abundant uredinia and telia were later produced. Five check plants of this species of Castilleja remained free of rust infection.

Damage to Pines

Cronartium stalactiforme, which is present in many lodgepole pine stands in southern Idaho, is partic-

[1]Grateful acknowledgment is made to Ranger E. Maurice Fickes of the Boise National Forest who provided assistance on felling trees for examination.

[2]Aeciospore material was sent to Dr. George B. Cummins, Purdue University, Lafayette, Indiana, who confirmed the determination.

ularly common in some of the stands on the Boise National Forest. On certain areas of the latter as many as 30 percent (estimated) of the trees have trunk cankers. Reports have been received of a few areas on which most of the trees were infected. A thorough and systematic survey would be necessary to accurately appraise the prevalence of this disease and the damage by it.

The effect of the cankers on trunks is to cause long and somewhat flattened or sunken areas. Resin impregnation of the wood usually occurs and occasionally stains caused by fungi are present. Sweep of the bole is associated with many of the cankers. These defects render trees largely unmerchantable for many purposes. Transverse cuts made through the central portion of cankers reveal a pronounced eccentric growth of the trunks at that point (Fig. 3). Occasionally snowbreak occurs in severely cankered trees. This type of damage may be common in areas of heavy snowfall. No decay of the wood has been observed in association with the cankers.

Control

No method of control of the disease caused by *Cronartium stalactiforme* is yet known. Indian paintbrush and the other closely related plants that have been reported as alternate hosts of the fungus would be difficult to eradicate under forest conditions. Removal of the diseased trees during the course of both cutting operations and timber stand improvement offers the best possibilities at the present time for reducing losses caused by the pathogen.

Summary

The native blister rust fungus *Cronartium stalactiforme* has been known to attack lodgepole pine for about 50 years. In the present paper, however, the large cankers caused by this pathogen on trunks of mature trees of that host are described and illustrated for the first time. These cankers may attain over 30 feet in length and yet not girdle the tree.

Rodents, presumably mainly pine squirrels or chickarees, feed on the diseased bark at the margins of the cankers. The damage to the pine has therefore generally been ascribed to rodents and the fungus has not been recognized as the primary factor leading to the removal of the bark.

The character of the damage to the pine is described and illustrated. Vertical growth of the cankers averages about 7 inches per year and lateral growth only about one-fourth to one-half inch. The oldest trunk canker studied was 39 years of age and 23.4 feet in length.

Removal of diseased trees during the course of silvicultural treatment of affected stands offers the only method now known for reducing losses caused by the rust.

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Forest Service Cooperates in Portland Watershed Study

A U. S. Forest Service watershed management specialist has been named as leader of a cooperative research project in Portland's Bull Run watershed. Joint announcement of the selection was made by city officials and Director R. W. Cowlin of the Pacific Northwest Forest and Range Experiment Station.

Nedavia Bethlahmy, staff member of the Northeastern Forest Experiment Station since 1946, has transferred to the Forest Service experiment station in Portland and will investigate the relation of timber cover to streamflow in the Bull Run watershed. Primary purpose of the 20-year study is to provide a sound basis for management of the city's water supply.

Information developed from the study it is believed will help the city provide an adequate supply of pure water for future needs and aid the Forest Service in carrying out the best possible watershed management practices on forest land under its jurisdiction. The Portland City watershed is located entirely within the boundaries of the Mt. Hood National Forest.

Estimating Allowable Cut Without a Type Map in Forests of Western Washington and Western Oregon

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INVENTORIES OF national forest working circles in the Douglas-fir region of the Pacific Northwest have had two specific objectives; one is data for calculating allowable annual cut, and the other is a forest type map for phases of forest management other than the calculation of allowable cut such as timber sales, thinnings, plantings, and protection.

Under approved survey methods the type map is essential to both objectives since it supplies all area statistics required for the allowable cut calculation. These statistics include total area in stands past rotation age and total area in stands less than rotation age, both of which are used in developing preliminary or "indicated" estimates of allowable cut by the Hanzlik formula:[1]

$$H = \frac{V_m}{R} + I$$

where H = indicated annual cut
V_m = total timber volume in stands past rotation age (i.e., total area in stands past rotation age multiplied by average volume from a sample of field plots taken in stands by rotation age)
R = rotation age (i.e., stand age at which mean annual increment is greatest as determined from normal yield tables)[2]
I = total mean annual increment in stands less than rotation age (i.e., total area in stands less than rotation age multiplied by maximum mean annual increment adjusted for actual stocking)[3]

[1]Hanzlik, E. J., 1922. Determination of the annual cut on a sustained basis for virgin American forests. Jour. For. 20:611-625.

[2]Since Hanzlik's formula is intended to provide only a tentative estimate of allowable cut which will be checked and adjusted, the use of an arbitrary "R" years in the formula is believed justified.

[3]Hanzlik originally proposed that "I" be based on mean annual increment at present age plus ½ rotation age. However, mean annual increment at rotation age is now being used for calculating "I."

The type map also supplies the information on areas of stands less than rotation age by age, site, and stocking classes, which is essential for an area-volume check[4] of indicated cut. In this check, areas and volumes of stands of given age, site, and stocking classes are projected through one rotation to see if indicated cut is consistent with the goal of eventual sustained production. If indicated cut is either too high or too low, it is adjusted, and the check is repeated.

Sometimes conditions are such that the type map, although possibly satisfactory for other phases of forest management, is believed incapable of supplying area statistics which are sufficiently accurate for calculating allowable cut. This occurs when experienced mappers are not available, when the aerial photos used in mapping are old or of poor quality, or when forest conditions on the ground are so indefinite and intermixed that any type map is likely to be very subjective. In such cases a change in survey procedure is indicated.

A new survey procedure was tried on the Quilcene working circle of the Olympic National Forest and on the Lowell working circle of the Willamette National Forest in 1953. The distinguishing feature of these trials was a simple grid of plots which supplied all area and volume information required for both allowable cut and area-volume check. Type maps were made for both working circles since they were considered essential to management, but they were not used to supply area statistics for the allowable cut estimate. Another feature was the use of empirical yield tables instead of normal yield tables for information on growth and on rotation age.

Methods used on these two working circles and some of the results are presented and discussed here for any value they might have in other situations where conditions do not favor forest type mapping.

[4]West Coast Forestry Procedures Committee, 1950. Recommended forest practices and techniques. Western Forestry and Conservation Assoc., Portland, Oregon.

Method

First a transparent overlay with four dots was applied to each photo in a group of aerial photos representing the gross working circle area. Pin holes were made in the photos at each dot. Placement of dots on the overlay was designed to give a systematic grid of equally-spaced ground locations covering the working circle. Differences in end-lap and side-lap between photos prevented spacing of precise uniformity but this was not considered important.

The ground position corresponding to each photo pin hole was taken as the starting point for a ½ chain by 10-chain plot. Each plot was represented on its photo by a line drawn within the condition class which typified the area in the immediate vicinity of the pin hole.

All plots except those definitely classified by photo examinations as something other than stocked coniferous forest were then visited on the ground to obtain the following information:

1. Plot classification. Each plot was classified as belonging to one of these categories: (a) nonforest; (b) noncommercial forest; (c) hardwoods; (d) nonstocked coniferous forest; (e) stocked coniferous forest. Coniferous plots were called stocked if they: (a) contained 2,500 board-feet Scribner (5,000 bd. ft. per acre) or

more in trees 11 inches and larger in diameter, or (b) twenty or more poles 5 inches to 11 inches in diameter, or (c) were 10 percent or more stocked (4-mil-acre basis) with seedling and sapling trees.[5]

2. Stand age (stocked coniferous plots only).

3. Net board-foot volume (stocked coniferous plots only).

Analysis

These formulas were used to compute required items of information from the samples in the two working circles:

$$p_m = \frac{n_m}{n_t} \quad (1)$$

where p_m = proportion of total working circle area in stocked coniferous stands past rotation age (i.e. in mature stands).
n_m = number of stocked coniferous plots past rotation age (i.e. mature plots).
n_t = total number of plots.

$$A_m = A_g\, p_m \quad (2)$$

where A_m = total mature area.
A_g = gross working circle area.

$$V_m = A_m \bar{x} \quad (3)$$

where V_m = estimated total board-foot volume in mature stands.
$\bar{x}$ = estimated average board-foot volume per acre calculated from mature plots only.

$$C = \frac{s}{\bar{x}} \quad (4)$$

where C = coefficient of variation for volume on mature plots.
s = standard deviation calculated from volume on mature plots only (acre basis).

$$E = 100\,\frac{s_{V_m}}{V_m} = 100\sqrt{\frac{C^2}{n_m} + \frac{q}{n_m}} \quad (5)$$

where E = standard error of estimated total mature volume in percent.
s_{V_m} = standard error of estimated total mature volume in board feet.
$q = 1 - p_m$

$$A_y = A_g \frac{n_y}{n_t} \quad (6)$$

where A_y = total area in all stands less than rotation age.
n_y = number of stocked coniferous plots less than rotation age.

$$I = A_y G \quad (7)$$

where I = total mean annual increment in all stands less than rotation age.
G = mean annual increment per acre at rotation age as determined from an empirical yield table (see below).

[5] Mixtures of saw timber trees, poles, seedlings and saplings are so rare on these forests that a rule covering them was not considered essential.

$$A_s = A_g \frac{n_s}{n_t} \quad (8)$$

where A_s = area in stands of all sites for a particular stands age class (for use in area-volume check).
n_s = number of stocked coniferous plots in the particular stand age class.

Rotation age was taken as the stand age corresponding to culmination of mean annual increment in an empirical yield table. An empirical yield table was developed for each working circle by plotting average net volumes of stocked coniferous plots by stand age classes over stand age class averages, drawing smooth curves, and listing curve volumes by stand ages. Each curve represented all sites and all degrees of stocking.

Values for V_m, R, and I were then substituted in the Hanzlik formula for an estimate of indicated allowable annual cut.

Finally, estimates of areas in young stands by stand age class (see formula 8 above) were used in an area-volume check of indicated cut. Average volumes necessary for the area-volume check were supplied by the empirical yield table.

Discussion

Survey costs under the new method (see Table 1) were similar in general to survey costs under the type map method on other working circles. Since sampling errors for mature timber volume were also about the same under both methods, there is no evidence that sampling for area estimates involves increased costs. Apparently effort required for a larger number of field plots under the new method is offset by effort required for the type map under the old method. Equivalent sampling accuracy in the estimation of mature timber volume was used as a criterion for this cost comparison because the amount of mature volume has an important effect on allowable cut in most National Forest working circles. It was also used because total annual growth and rotation age, the other estimates required for indicated allowable cut, are subject to less tangible considerations than sampling error. For example, the assumptions underlying growth estimation procedures are probably more important than sampling errors of growth estimates. Some aspects of the procedure for selecting an ideal rotation age are not susceptible to objective analysis.

Coefficients of variation listed in Table 1 probably could be used with assumed as proportions of mature plots (p_m) for advance estimates of sample size in planning similar surveys. This, of course, assumes that sampling error of estimated total mature volume is to be the basis for establishing sample size.

TABLE 1.—SOME RESULTS FROM A TEST OF FOREST SURVEY PROCEDURES ON TWO WORKING CIRCLES IN THE DOUGLAS-FIR REGION

Result	Symbol	Quilcene working circle, Olympic National Forest	Lowell working circle, Willamette National Forest
Cost per acre		$0.0354	$0.0735
Standard error of estimated total mature volume	E	5.18%	5.00%
Coefficient of variation for mature volume	C	0.500	0.384
Total number of plots	n_t	1,029	340
Number of mature plots	n_m	342	211
Number of plots in coniferous stands less than rotation age	n_y	348	115
Number of non-stocked coniferous forest plots	n_d	4	9
Number of non-commercial plots	n_x	277	5
Number of hardwood plots	n_h	2	0
Number of non-forest plots	n_o	56	0
Total working circle area (acres)	A_t	238,000	148,000
Average volume per acre for mature stands	$\bar{x}$	56 m.b.f.	73 m.b.f.
Rotation age	R	130	130
Mean annual increment at rotation age		280 b.f.	476
Indicated allowable cut	H	53 million b.f.	74 million b.f.
Allowable annual cut after area-volume check		59 million b.f.	80 million b.f.[1]

[1] Subject to final approval.

Total number of plots for the Quilcene survey may seem excessively large; however, many of these were other than stocked coniferous plots and were classified definitely and inexpensively by photo interpretation alone. Almost all of the Lowell plots had to be seen on the ground for definite classification.

The choice of empirical yield tables over normal yield tables for growth and rotation age estimates is difficult to justify. Assumptions underlie both approaches, and opinion regarding the acceptability of these assumptions is probably the only basis for choosing. The normal yield table approach requires estimates of site index, and site index is subject to considerable sampling error.[6] It also requires arbitrary and questionable assumptions about trends in stocking for young stands. Another important consideration is the problem of what to do about forest types for which there are no normal yield tables.

But empirical yield tables are also under a cloud. The implied assumption of constant average site throughout the range of stand ages used for the empirical yield tables may be untenable. If average site varies with stand age on a particular working circle, both rotation age and mean annual increment at rotation age may be biased. Failure to credit the beneficial effects of more intensive forest management in the future might also be considered a disadvantage of the empirical yield table approach.

Although a clear case could not be established for either approach, opinion favored using empirical yield tables for the two working circles at least on a trial basis. The alternative seemed to require more assumptions and to be less direct.

Techniques for estimating areas on the Quilcene and Lowell working circles were similar to those used on the nationwide forest survey in eastern states. However, greater emphasis is generally placed on photo interpretation in the East where large samples of points are often classified on photos to supply area estimates. These estimates are then corrected to accomodate errors in classification found on subsamples of points selected for field examination. In the Douglas-fir region there were believed to be too many difficult distinctions between stands of different ages, between commercial and noncommercial forest land, and between stocked and nonstocked coniferous forest land to justify such intensive photo work. This would be particularly true when photography is old or of poor quality. The provision for definitely classifying each sample plot was, therefore, an essential part of the method used for the Quilcene and the Lowell surveys. Under this provision any degree of doubt concerning a plot believed by photo examination to be other than stocked coniferous forest land was sufficient reason for going to the plot. The method required going to all stocked coniferous plots for data that could only be obtained on the ground.

One advantage of the method discussed in this report is the facility with which it could be converted into a continuous inventory system. This could be accomplished simply by preserving the original photos and by marking plot locations permanently on the ground. A series of surveys at 5- or 10-year intervals based on identical plots should guarantee consistency for subsequent estimates of allowable cut. Allowable cut estimates from a series of surveys by the type map method are likely to vary considerably because of changes in mapping techniques, changes in mapping facilities, and corrections of past mapping errors. This might be true even under optimum mapping conditions. Repeated observations on the same plots could also lead to better estimates of growth.

Type maps were made as a by-product of both the Quilcene and the Lowell surveys. These maps were developed in the office using only aerial photos and information obtained at plots. They were considered satisfactory for most purposes of forest management but not for the calculation of allowable cut.

Summary

A method for estimating allowable cut under which area statistics are obtained by sampling rather than from a type map has been described and discussed. The method was tried on two National Forest working circles. Results are expected to be useful in planning similar surveys.

Survey costs under the area sampling method were roughly comparable to costs found previously on other working circles under the type map method. Sampling errors for the total mature volume portion of the allowable cut estimate were also about the same under both methods.

Empirical yield tables were apparently satisfactory for the estimates of rotation age and total annual growth which are required for the allowable cut formula. Although an objective basis for comparing empirical yield tables against normal yield tables for these purposes was not found, empirical yield tables seemed to have the advantages of simplicity and directness.

The nature of the inferences required from aerial photos and the conditions under which area sampling is likely to be used were given as the reasons for not using photo interpretation techniques to any great extent in the method tested.

A possible advantage of the method is the ease with which it could be modified to accommodate the requirements of a continuous inventory survey.

[6] Johnson, F. A., and Carmean, W. H., 1953. Sampling error in the estimation of site index. Jour. Forestry 51:26-27.

The Use of Chemicals in Controlling Forest Stand Composition in the Duke Forest

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THE USE of tree poisons in stand improvement work presents many basic problems to the landowner. The most effective chemical and concentration, cheapest method of application, and the best season all vary with the species, labor supply, and environment conditions. Although information obtained by foresters in other regions can be used as a guide in planning stand improvement work, ultimately the decisions must be based on local experience if the most efficient methods are to be employed.

In order to obtain precise information on poisoning techniques for the Piedmont region of North Carolina, two experiments were carried out in the Duke Forest. Initially, a time and cost study was designed to determine the cheapest method of applying tree poisons and the costs of these operations.[1] Later, a second experiment was established to find the relative effectiveness of specific concentrations of two widely used silvicides, and to determine the effects of season, diameter of tree, and concentration of chemical on the percentage of mortality.

Time and Cost Study

In the time and cost study three widely used methods of poisoning were compared with girdling. These poisoning methods are frilling, cupping at a convenient chopping height, and cupping at ground level. In the frilling or single-hack-girdle method, a single line of overlapping downward axe cuts is made around the bole, and the poison is poured or sprayed into the incisions until the exposed wood surface is thoroughly soaked. Frills are customarily made at a convenient chopping height, which in most cases is approximately 4 feet above the ground level. In the cupping methods, notches are chopped at regular intervals around the circumference of the bole. Cups are approximately 6 inches wide and 1 to 1½ inch deep—a distance of 4 inches is usually maintained between adjacent cups. One or two tablespoonsful of crystals are customarily packed into each notch. Cups or notches may be cut at a convenient chopping height or at the root collar; however, notches which are located near the root collar afford greater penetration of the poison into the roots.

Description of experimental area.—The time study was established on a 24-acre area which had been cut over between 1945 and 1947. Most of the merchantable volume was cut during this operation, but some of the best yellow-poplar (*Liriodendron tulipifera* L.) and white oak (*Quercus alba* L.) were reserved as a seed source to restock the area. In addition, scattered unmerchantable trees were left, forming a broken overstory on the entire tract. These undesirable trees consisted of hickory (*Carya* spp.), beech (*Fagus grandifolia* Ehrh.), dogwood (*Cornus florida* L.) and sourwood (*Oxydendrum arboreum* (L.) DC.) as these species are not merchantable in this section of North Carolina. In addition, oaks (*Quercus* spp.), sweetgum (*Liquidambar styraciflua* L.), blackgum (*Nyssa sylvatica* Marsh.) and ash (*Fraxinus* spp.) of poor form or condition were left. During the next few years a dense carpet of yellow-poplar regeneration became established throughout most of this tract. By 1950 the unmerchantable hardwoods which formed the broken overstory were beginning to suppress the yellow-poplar seedlings. If this reproduction were to survive, its liberation would be necessary. Consequently, this area seemed ideally suited for comparing these various poisoning techniques.

Experimental design and procedure.—The 24-acre experimental area was divided into six 4-acre blocks. Within each block four 1-acre strips were laid out, and the four poisoning methods or treatments were assigned at random within each block. This design gave six replications of each treatment.

Mimeographed forms were prepared to facilitate the field work. On these sheets the axeman's activities during the day were classified and recorded as productive and unproductive time. The latter was further subdivided into walking time, rest time, and delay time. When productive time was recorded, the species and diameter class of the tree were noted. The working time of the poisoning man was not broken down into productive and unproductive time. However, the time that the poisoning man spent in each acre was known, and the number and d.b.h. of the trees in each area had already been tabulated on the time sheets of the axemen.

Two axemen cut the frills, cups, or girdles. Two timers stayed by the axemen constantly. The poisoner worked about a chain behind the axemen. Each operation was timed to the nearest 5 seconds.

A solution of 4 pounds of Ammate per gallon was used for the frills. One heaping tablespoonful of Ammate crystals was packed into each cup. Observations in the field showed that one poisoner was able to keep up with two axemen without much difficulty.

This study was carried out in the last two weeks of July, 1950,

[1]The writer is indebted to B. F. Smith for assistance in collecting the field data in this study.

during very warm weather; the temperature reached 90° F. or higher each day. The production rate of the men probably would have been higher during other seasons of the year.

Statistical analysis.—In the initial phase of the statistical analysis the productive times for each treatment were grouped by species and tabulated by diameter classes. Next, the species within each treatment were combined into two groups: those with bark which is difficult to cut with an axe or hard-barked species, and those with bark which is easy to cut or soft-barked species. Field observations had indicated that oaks and hickories belonged to the hard-barked group, and sweetgum, blackgum, ash, and dogwood belonged to the soft-barked group.

Each of these eight treatment and species groups was analyzed using a regression equation of the form:

$$Y = a + b\,(D - \bar{D})$$

where Y = the time in seconds required to girdls or cut frills or cups.
D = the d.b.h. in inches.
a and b = numerical coefficients to be obtained from the data.

Within each treatment and species group the average time for each diameter class was computed. Each average time was given a weight equal to the number of observations in that diameter class.

Next, the general and common regressions were calculated for the two species groups within each of the four treatments in order to determine whether these group regressions were significantly different. These tests showed that the difference in axe time between hard-barked and soft-barked species was significant for two treatments (cupping at a convenient height and at ground level), but not for the other two (girdling and frilling). Consequently, from this point in the analysis onward the hard-barked species and soft-barked species were combined within the frilling and the girdling treatment classes.

Analyses of the walking and delay times showed that there was no significant difference between walking and delay time for either of the four treatments. Consequently, an average walking time and an average delay time per tree was computed for all treatments. Analysis of the rest times indicated that the amount of rest time required while applying each treatment was significantly different. Girdling required the most rest time. Cupping at ground level and cupping at a convenient chopping height required much more rest time than frilling.

For each of the poisoning operations, frilling, cupping at a convenient chopping height, and cupping at ground level, a regression analysis was made. For any one poisoning treatment it was assumed that the time spent in any one area could be expressed by the equation:

$$\overset{n}{S}(Y) = b_0 n + b_1 \overset{n}{S}D$$

where $\overset{n}{S}(Y)$ = the total time spent by the poisoning man in each area.
n = the number of poisoned trees in each area.
b_0 and b_1 = numerical coefficients to be obtained from the data.
$\overset{n}{S}D$ = the sum of the diameters of the poisoned trees in each area.

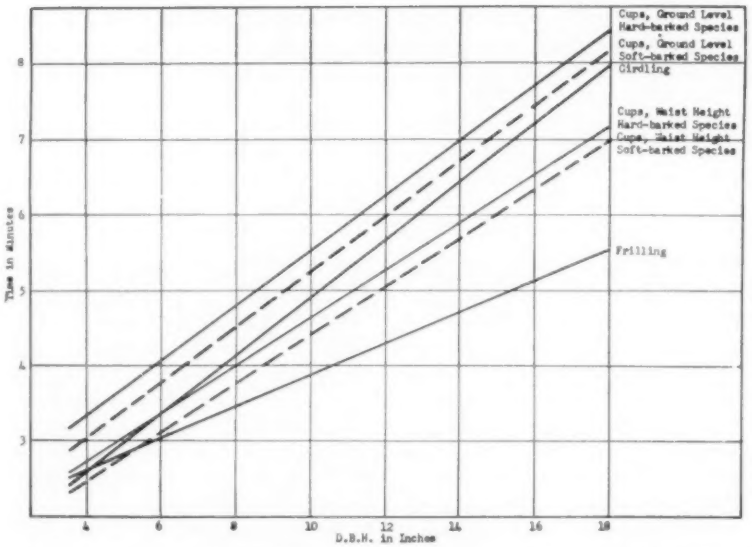

FIG. 1.—Relationship between d.b.h. and total time required for girdling, frilling or cupping. Treatment time includes chopping time, delay time, rest time and poisoning time.

The normal equations and the analysis of variance for the group regressions of these three poisoning methods were obtained. Then the general and common regression were calculated to determine whether these three group regressions were significantly different. This analysis showed that the regressions for putting poison in frills and cups at waist height were not significantly different, but placing poison in cups at ground level required significantly more time. Figure 1 shows graphically the relationship between girdling, frilling and poisoning, cupping at a convenient chopping height and poisoning, and cupping at ground level and poisoning.

Concentration and Season Study

Experimental design.—This experiment was established adjacent to the 24-acre experimental area used for the time and cost study. The history, form, and composition of this stand were similar to that on the 24-acre area previously described. Mockernut hickory (*Carya*

tormentosa Nutt.) was chosen for this experiment since it is more frequently necessary to eliminate this species than any other in stand conversion and stand improvement projects in the Duke Forest. This hickory is moderately difficult to kill. Information obtained from this study should be applicable to a large number of other species found in the Piedmont.

During March, 1951, 320 mockernut hickories were selected from a 10-acre area. These trees ranged in diameter from 4 to 18 inches, and were so selected that there were 40 individuals in each even-inch class. For example, the 4-inch diameter class included trees from 3.1 inches d.b.h. to 5.0 inches d.b.h. The diameter classes were interspersed throughout the experimental area.

April and August were selected as the two periods for poisoning, as it was believed that any differences in the effectiveness of these poisons attributable to season would be most pronounced between these two periods. In April, 1951, the trees in the 4-, 8-, 12-, and 16-inch d.b.h. classes were divided into two groups, each containing 80 trees. These two groups each included 20 trees in the 4-inch class, 20 trees in the 8-inch class, 20 trees in the 12-inch class, and 20 trees in the 16-inch class. The trees in Group 1 were frilled and treated with specified concentrations of Ammate, and the trees in Group 2 were frilled and treated with specified concentrations of 2,4,5-T (the isopropyl ester of 2,4,5-trichlorophenoxyacetic acid).

Four concentrations of Ammate crystals in a water carrier were used for the trees in Group 1: ½, 1, 2, and 4 pounds per gallon. These concentrations were selected purposely to provide one concentration so weak that only a small number of individuals would be killed, and one concentration strong enough to assure nearly complete kill. In a similar manner, four concentrations of 2,4,5-T were chosen, namely ½, 1, 2, and 4 percent, all on a volume basis. These concentrations were used in frills in Group 2. Within these two groups the 20 trees in each diameter class were divided into four units of five trees, and one of the four concentrations was assigned at random to the tree in each unit.

In August, 1951, the trees in the 6-, 10-, 14-, and 18-inch d.b.h. classes were divided into two groups, Groups 3 and 4. Each of these groups had 80 trees. These groups each contained 20 trees 6 inches d.b.h., 20 trees 10 inches d.b.h., 2 0trees 14 inches d.b.h., and 20 trees 18 inches d.b.h. The same concentrations of Ammate and 2, 4,5-T were used in August as in April.

Field methods. — One axeman from the Duke Forest crew cut all the frills to avoid any possible variation in the manner in which the frills were made. The appropriate chemical was applied to each tree immediately after frilling. A specified amount of poison solution was applied per inch of circumference. This dosage was previously determined through field tests in which trees of known diameter were poisoned and the amount of solution used per tree was determined. The amount of poison solution was found to be approximately 3 cc. per inch of circumference.

Statistical analysis of data for concentration and season study.— The percentage of kill in each treatment and diameter class was determined 1 year after each group was poisoned. To test the effect of each poison statistically, and determine the effect of season, diameter, and concentration, these variables and their interactions were combined into the following equation:

$$Yp = b_0 + b_1 (log\ C) + b_2 D + b_3 P + b_4 T + b_5 PT + b_6 P (log\ C) + b_7 T (log\ C) + b_8 PT (log\ C) + b_9 DP + b_{10} DT + b_{11} DPT$$

where Yp = the probit of the percentage of kill.
$\log C$ = the logarithm of the poison concentration.
D = the d.b.h in inches.
P = the poison applied (+1 was used for Ammate, and −1 was used for 2,4,5-T).
T = the time of year (+1 was used for trees poisoned in April, and −1 was used for trees poisoned in August).
b_0, b_1 b_2 etc. = numerical coefficients to be obtained from the data.

The normal equations for this regression were obtained. From these equations the forward solution and the mean square residuals were calculated. Concentration, season and poison were all found to significantly affect the percent kill. The effect of poison concentration on the percentage of kill is shown in Figure 2.

Interpretation of Results

In order to compare these four treatments on an economic basis, the cost of applying each treatment was computed. To derive these figures the total time required by each treatment for the even-inch diameter classes was obtained from Figure 1. A representative hourly wage of $0.95 was adopted. From these data the cost of the labor was computed for each treatment for a wide variation of tree sizes. The cost of the poison solution for frilling was calculated on a basis of 3 cc. of poison per inch of circumference for a 4-pound-per-gallon Ammate solution, and a price of $0.22 per pound for Ammate crystals. For one heaping tablespoonful (approximately 1 ounce) per cup, the cost of the poison per cup was calculated to be 1.4 cents. Combined labor and poison costs are shown in Table 1.

Several interesting conclusions may be drawn from these cost figures. The cost of girdling is almost identical with that of frilling plus poisoning. Cups at waist height and cups at ground level cost approximately 1.4 and 1.7 times as much, respectively, as girdling. Although these differences appear relatively unimportant when trees of small d.b.h. are compared, this contrast becomes increasingly important as the diameter increases.

The cost of frilling small trees is slightly higher than that of girdling. However, it would seem desirable to frill small trees, since frilling with poisoning eliminates

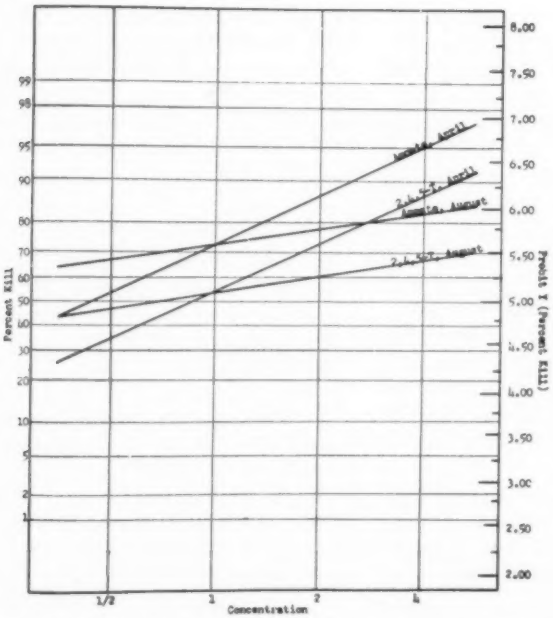

FIG. 2.—Relationship between concentration of poison solution and percentage of mortality for frilling and poisoning mockernut hickory. The relative effectiveness of Ammate and 2,4,5-T are shown when these two poisons are applied in April and August. The concentrations of Ammate are given in pounds per gallon, and the concentrations of 2,4,5-T are given in percent (volume basis).

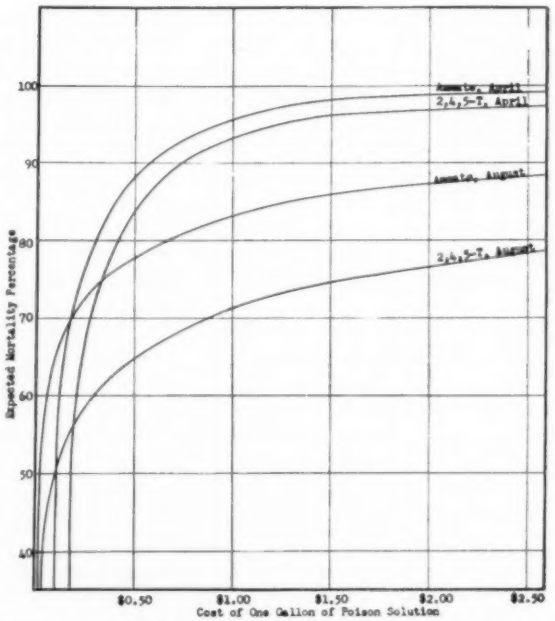

FIG. 3.—Relationship between cost of one gallon of chemical solution and expected mortality percentage. In obtaining the cost of poison solutions of various concentrations, market prices of $.22 per pound for Ammate crystals and $9.50 per gallon for 2,4,5-T extract were assumed.

the sprouting which would inevitably result if trees of this size were girdled. Frilling and poisoning become progressively less expensive than girdling when trees larger than 12 inches d.b.h. are compared. These facts indicate that frilling and poisoning is a more desirable method of eliminating undesirable hardwoods than girdling.

Both cupping methods are too expensive to be used in large-scale poisoning programs. Figure 1 indicates that cupping requires more time than frilling. In addition, cups demand more poison per tree. In some instances, cups might be used for convenience when a few individuals are treated, if the amount of poison required would not warrant the preparation of a gallon of solution. Cupping at ground level is more awkward and more expensive than cupping at a convenient chopping height. The effort required to chop cups at the root collar was evident in the large amount of rest time necessary when applying this treatment.

Two years after this study was carried out, field observations were made throughout this experimental area in order to determine whether the mortality obtained by each treatment was satisfactory. Although a high percentage of kill had been obtained from each method, frilling and cupping at ground level appeared to be the most effective. Many of the girdled trees had sprouted below the girdle. Others were gradually dying, but were still alive 2 years after treatment. Several large hickories and oaks which had been cupped at a convenient chopping height were still vigorous and appeared to have recovered from the effect of the poison. It was concluded that frilling and cupping at ground level produced the highest mortality for all species.

The species treated in this experiment can be broken down into three distinct groups based on their

TABLE 1.—TOTAL COST REQUIRED FOR EACH TREATMENT BASED ON AN HOURLY WAGE OF $0.95 AND A COST OF $0.22 PER POUND FOR AMMATE.

Treatment	D.b.h. in inches 4	6	8	10	12	14	16	18
	Cost in cents							
Girdling	3.1	4.7	6.5	7.7	8.9	10.2	11.4	12.6
Frilling	4.8	5.8	6.9	8.0	9.0	10.0	11.1	12.2
Cupping, waist high (Soft-barked)	5.3	7.7	8.7	11.1	13.6	14.6	17.0	18.0
Cupping, waist height (Hard-barked)	5.7	8.0	8.8	11.5	13.9	14.9	17.3	18.3
Cupping, ground level (Soft-barked)	6.2	8.7	9.9	12.4	15.0	16.2	18.7	19.9
Cupping, ground level (Hard-barked)	6.6	9.2	10.3	12.9	15.5	16.6	19.2	20.3

ability to survive poisoning with Ammate.

Easy-to-Kill Species

Dogwood
Red maple
Sourwood
Redbud

Moderately Difficult-to-Kill Species

White oak group
Red oak group
Hickories
White ash
Hornbeam
Hop-hornbeam

Difficult-to-Kill Species

Sweetgum
Blackgum
Beech

Figure 2 indicates that Ammate is more effective than 2,4,5-T when applied in frills on mockernut hickory. A 4-pound-per-gallon solution of Ammate will give 95-percent kill if applied early in the spring. This was the highest mortality obtained from any concentration used in this study. If a mortality of 90 percent is considered sufficient, these results indicate that 2.5 pounds of Ammate per gallon of water will be sufficient, provided the poison is applied in the early spring. This same concentration will give only an 80-percent kill if used in the summer.

Frilling and poisoning with 2, 4,5-T during the early spring is more effective than poisoning in the mid-summer. A 5-percent solution (volume basis) will assure a kill of 90 percent when applied just before the leaves appear, but will give a mortality of slightly less than 70 percent if applied during the summer.

Field observations indicate that Ammate works more quickly than 2,4,5-T. Trees treated with Ammate frequently die within a month. Trees treated with 2,4,5-T die more gradually. If observations had been made over a longer period than that used in this study, it is possible that the mortality from these two poisons might have been more nearly equal.

The effect of diameter was found to be insignificant. This is of particular interest since questions frequently arise concerning the value of increasing the concentration of chemical when treating trees of large size. It is evident from the regression equation that any concentration of sufficient strength to give the desired kill may be used with the same results on trees of any diameter. It seems logical that the effect of diameter is not significant, since the volume of the chemical solution which is applied is directly proportional to the circumference.

The relationship between the cost of 1 gallon of poison solution and the expected mortality is shown in Figure 3. To obtain the cost of poison solutions of various concentrations, market prices of $.22 per pound for Ammate crystals and $9.50 per gallon for 2,4, 5-T extract were assumed. The relationship between concentration and percentage of mortality was obtained from Figure 2. In Figure 3 it is apparent that the chemical concentration must be selected with great care. If the proportion of poison is reduced below a certain level, a drastic decrease in the effectiveness results. On the other hand, after a certain concentration of chemical is reached, no appreciable increase in percentage of mortality is obtained by further increasing the concentration. The cost of the poisoning operation can be kept at a minimum if the concentration is selected with these facts in mind.

Sprouting was observed occasionally from hickories in the 4- and 6-inch d.b.h. classes. These shoots originated predominantly from roots near the surface of the ground and from the root collar. In general, the trees which sprouted were those which received the lowest concentrations of poisons. No noticeable difference in the number of sprouts was detected between those trees treated with Ammate and those treated with 2,4,5-T.

Summary

Studies were made in the Duke Forest to obtain more definite information concerning the use of tree poisons for controlling stand composition. Initially, a time and cost study was designed to determine the least expensive method of applying tree poisons and the cost of these operations. Later, a second study was carried out to determine the relative effectiveness of various concentrations of Ammate (ammonium sulfamate) and 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) when applied to trees of different diameter classes in the early spring and mid-summer.

Statistical analyses of the data obtained in these studies have led to the following results and conclusions:

1. The cost of frilling and poisoning is almost the same as the cost of girdling. Making cups at waist height or cups at ground level costs approximately 1.4 and 1.7 times as much, respectively, as girdling. Although these differences appear relatively unimportant when trees of small d.b.h. are compared, this contrast becomes increasingly important with increase in diameter.

2. The cost of frilling and poisoning trees, 12 inches d.b.h. or smaller, is slightly higher than girdling. Frilling becomes progressively less expensive than girdling when trees larger than 12 inches d.b.h. are compared. Since frilling eliminates sprouting and the costs for each method are nearly the same, it is evident that frilling and poisoning is a more desirable method of eliminating hardwoods than girdling.

3. Chopped cups at waist height or at ground level are too expensive to use in large scale poisoning programs. Cupping requires more time than frilling. In addition, cups require considerably more poison per tree. Cupping at ground level was considerably more expensive than cupping at a convenient chopping height because of the inconvenience of bending over to chop the cups and to place the poison in them. A larger amount of rest time was necessary when cups at ground level were used than for cups at waist height or frills.

4. Observations, made two years after the time and cost study was made, indicated that frilling at a convenient chopping height, and cupping at ground level were more effective than girdling or cupping at waist height. Many girdled trees sprouted below the girdles, and several large hickories and oaks which had been cupped at waist height were still vigorous and appeared to have recovered from the effects of the poison. It seemed evident that frilling and cupping at ground level gave the highest mortality for all species.

5. One year after poisoning, field observations indicated that Ammate was more effective than 2,4,5-T when applied to the frills of mockernut hickory.

6. Frilling is more effective in early spring than in mid-summer. In order to obtain high mortality in the summer the concentration must be increased above that used in the spring.

7. A definite relationship exists between the concentration of the poison and the expected percentage of mortality, indicating that the concentration must be selected with great care. If the proportion of poison is reduced beyond a certain level, a drastic decrease in effectiveness results. On the other hand, after a certain concentration of chemical is reached, increasing the concentration does not result in an increase in the percentage of mortality.

8. The effect of diameter was found to be significant. This is of particular interest since questions frequently occur concerning the value of increasing the concentration of chemical when treating trees of larger diameters. This study indicated that poison solution of sufficient strength to give the desired percentage of mortality may be used with the same effectiveness on trees of all diameters.

Gordon Lewis Chapman (1917-1956)

Gordon Lewis Chapman, 38, associate professor of forestry at the University of Maine and associate forester in the Maine Agricultural Experiment Station, died on May 29, of a brain tumor.

Born December 9, 1917, in Portland, Maine, he was graduated in 1939 from the University of Maine with a degree of bachelor of science in forestry. In 1941 he received a master of science degree from the University of Vermont and in 1950 a doctor of philosophy degree from Yale University. While a graduate student he was a field assistant in silvicultural research, his field of specialization.

Between 1942 and 1945 Professor Chapman was a cartographer for the United States Geological Survey where he participated in the preparation of maps essential to the military effort.

He joined the faculty of the University of Maine in 1948. As the professor of silviculture he emphasized the scientific approach. As director of the University Forest (a portion of which will henceforth be known as the Gordon Chapman Memorial Forest) he established a series of demonstration plots which represent a definite contribution to the knowledge of silviculture in this region. As a research worker he prepared valuable technical notes and was engaged in several major projects which were to be completed and published in the near future.

Notes

Collection of World Forest and Forest Products Statistics

Although some international statistics of production and trade in forest products were collected and published for 1925 and subsequent years prior to World War II by the International Institute of Agriculture, the coverage for all regions of the world has been considerably extended since the Food and Agriculture Organizations of the United Nations started publishing its statistics in 1946. Since that time the F.A.O. and the United Nations Economic Commission for Europe (E.C.E.) have worked together in forestry statistical matters and their joint quarterly volume, *Timber Bulletin for Europe*, reports selected production and trade data for the European and North American countries. The annual *FAO Yearbook of Forest Products Statistics*, with world-wide coverage, has appeared regularly since 1947 and the results of the quinquennial FAO world forest inventory were published in 1948 and 1955. A variety of other statistics is collected for the E.C.E. Timber Committee and the F.A.O. European Forestry Commission.

Meeting of Statisticians Called

The work of F.A.O. and E.C.E. has exposed a multiplicity of problems, difficulties and questions—such matters as concepts, definitions, conversion factors, techniques of collection, and organization of national and international statistical programs. To seek competent advice on these problems the F.A.O. and E.C.E. invited European and North American countries to send forest and forest products statistical experts to the first meeting of the joint working party which convened in Geneva, Switzerland, during the week ending January 28, 1956.

The agenda for the meeting included the outlining of a minimum program of forest and forest products statistics, discussion of fellings, removals, and roundwood utilization, the 1958 world forest inventory, felling forecasts, forestry investments, and some problems of pulpwood statistics.

A leading item on the agenda was the formulation of a minimum long term program to serve as a model and framework for the development of forestry statistics in all countries of the world. The objectives of a minimum program were described as follows: to provide the statistical data needed for policy formulation in forestry and in the timber industry, to show interrelations between the timber economy and the rest of the national economy, to guide statistical improvement, and to provide a basis for internationally comparable statistics.

The working party agreed on the several categories of information to be collected nationally and in some cases internationally under the main headings of forest area, growing stock; growth, mortality, and cut; primary forest industries, labor statistics, domestic roundwood supply, output of processed wood, domestic supply of minor forest products, stocks of forest products, external trade, prices, utilization and end-use statistics, and conversion factors.

World Forest Inventory

Several significant decisions were taken on the 1958 world forest inventory. Although the pattern of the previous (1953) inventory will be retained in order to maintain comparability in the figures, several changes were suggested. The main forest land classifications of "accessible" and "inaccessible" will be revised to provide a better picture of present and potential forest resources of the world. A new density classification was adopted, and data on the size distribution of privately owned forest lands will no longer be collected. Several other minor changes in the 1953 world forest inventory questionnaire were suggested.

Felling Statistics

Fellings statistics have been found to be difficult to assemble on an annual basis, therefore the working party suggested abandonment of the annual series but retention of the fellings figures of the 5-yearly world forest inventory. Several years' experience in attempting to collect figures on roundwood utilization has shown that in no European country are these data available. The utilization statistics reported were, in most instances, calculated by analyzing fellings into the various roundwood categories, e.g. fuelwood, poles, piling, posts, or sawlogs, and adding the relevant import/export balances. The decision of the working party, therefore, was to abandon annual utilization statistics, and to introduce a new series on annual removals of roundwood. The annual removals (fellings minus logging and transport losses) will be shown in two classes: those from the forests and those from trees outside the forests, for example, from roadside trees, city parks, fields, gardens, etc. Each of these two main categories will show total removals of fuelwood and of industrial wood separately. Industrial wood will be further broken down into three classes: pulpwood and pitprops; sawlogs, veneer logs and logs for sleepers; and other industrial wood. Commercial and noncommercial removals will be reported separately because estimates of the latter are often less precise.

Forward estimates of fellings in various countries are of great interest to foresters and timber trade people in a region such as Europe where national economies are so interdependent and trade relations

are of such immediate and vital importance.

Estimates of expected fellings for several decades ahead are considered to be of great value in planning forest management and forest industries development. The working party considered felling forecasts very desirable and recommended that European and North American countries report their forecasts for the years 1960 and 1965, explaining clearly the bases and assumptions upon which the estimates are made. Some of the ways felling forecasts could be made were listed as: on the basis of specific felling plans or programs, on the basis of the allowable cuts and estimates of present conditions in unmanaged stands as well as expected yields of plantations and expected trends in consumption; and, finally, on the basis of silvicultural or other factors currently used by various countries for forecasting fellings.

Forestry Investments

In view of the fact that national and international statistics are being collected on investments in various important industries and on the effect of these investments on future output, the same kind of information in the field of forestry was considered to be very desirable. The working group observed that the problems in collecting these data are formidable, including for example the difficulties of contacting all the sources of investment capital, distinguishing between investment made for forestry and other, perhaps multiple-use, purposes, and the multiplicity of expected returns from the investment. The practical and conceptual problems in analyzing monetary and non-monetary returns associated with forestry investments place forestry in a class apart from industries such as, for example, steel and chemicals. The working party therefore suggested limiting initial statistics of investment to afforestation and plantations outside the forest. A survey of available data will be made and a report presented to the next meeting of the group.

Pulpwood

As a final major item on the agenda the statisticians discussed the problems involved in gathering pulpwood information. Pulpwood definitions vary between countries and much of the wood moving to pulp mills through international trade channels does not appear as pulpwood in the trade records. The trade accounts of several countries do not include as pulpwood any of the nonconiferous species or any wood material over a specified length, (e.g. 50 inches). An analysis of pulpwood consumption in six European countries for 1951 and 1952 shows that 63 percent of total consumption is in coniferous species, 16 percent is nonconiferous, and the remaining 21 percent is of wood materials classified as other than pulpwood, viz: (in percentages) wood waste 7½, sawlogs, 6½, pitprops and similar roundwood 5, and fuelwood 2. The problem of an agreed definition of pulpwood was deferred for further study, but, in the meantime, an effort will be made to collect annual statistics on utilization of pulpable wood materials other than small-sized roundwood.

Represented at the Geneva meeting were: Austria, Belgium, Finland, Eastern Germany, Western Germany, France, Italy, Netherlands, Norway, Sweden, Switzerland, United Kingdom, the Soviet Union, and the United States. The forestry delegate from the United States was H. R. Josephson, chief of Forest Economics Research, U. S. Forest Service, who served as one of the vice-chairmen of the working party and was the chairman of a special drafting committee on labor statistics.

The next meeting of the working party on forest and forest products statistics is scheduled for Geneva in November, 1956. Topics likely to be discussed include statistics of forest fires, pulpwood, investments, production and trade, and forest labor.

J. O. LAMMI
Timber Division
Economic Commission for Europe
Geneva

Reproduction of Slash Pine Outside Its Natural Range

Well-established natural reproduction of slass pine (*Pinus elliottii* Engelm. var. *elliottii*) has been found in and adjacent to a 24-year-old plantation of slash pine on land of the Agricultural Experiment Station of the Alabama Polytechnic Institute at Auburn. This location is about 75 to 100 miles north of the natural range of slash pine in the Gulf Coastal Plain and about 400 feet higher than the usual altitudinal limit of natural occurrence. Seed source of the plantation is not known, but it is recorded that the seedlings were furnished by the Louisiana Department of Conservation.

Most of the reproduction is widely scattered along the edges of a seldom-used, graded but unmaintained roadway that borders the south side of the plantation. Seedlings in the roadway range in height from 2 to 8 feet and appear to be about 4 to 5 years old. The soil is a Norfolk loamy sand. Undoubtedly, the almost-bare roadway furnished an especially favorable seedbed. However, one seedling about 2 feet tall and probably 4 years old has been found inside the plantation. It is about 10 feet from the edge of the roadway and one foot from the stump of a planted tree that was cut in thinning 5 years ago. It is likely that it originated from a seed that fell on soil bared by logging disturbance.

No systematic search for reproduction in the Auburn slash pine plantations has been made. However, 2 badly suppressed individuals have been spotted just inside the west edge of a 23-year-old planting. The seedlings are about 18 inches tall and appear to be at least 3 years old. The soil is a Chesterfield sandy loam, stony phase. The litter is thin and discontinuous, and there is a scattered cover of grass.

KNOX W. LIVINGSTON
Forestry Department
Alabama Polytechnic Institute
Auburn, Alabama

More on Late Seasonal Growth of Red Pine

Kenneth L. Carvell's Note in the April issue of the JOURNAL: "Summer Shoots Cause Permanent Damage to Red Pine,"[1] was extremely interesting. Some earlier work was carried on in New York State with respect to this phenomenon. The condition was noted in red pine plantations on the Rochester City Watershed in western New York as early as 1933 and was the subject of frequent observations and comments by Dr. H. H. York and his associates during the next four or five years. The definitive work on the subject was done by Jump,[2, 3] working under York's direction and the paper published by him in *Phytopathology* constituted a dissertation presented in partial fulfillment of the requirements of Doctor of Philosophy at the Graduate School of the University of Pennsylvania.

I think it would be interesting to the readers of the JOURNAL to peruse the summary of this dissertation which I quote herewith:

"An abnormal bifurcation of red pine trees is prevalent in New York State and other sections of the northeastern United States. This condition is caused by extra-seasonal shoot elongation in which the lateral buds take part while the terminal remains in the dormant condition. Failure of the inner surfaces of the resulting fork to unite completely during subsequent growth of the tree causes on open fissure in which wood-destroying fungi may enter. *Tympanis* spp. also frequently gains entrance in this manner. No correlation was found between rate of forking and site conditions. Trees at high altitudes in the northern part of the area studied showed the lowest percentage of forking. *Dematium pullulans* de Bary was isolated from abnormal buds in the majority of cases, and hyphae of the characteristic form of the organism were found in the wood of abnormal trees. Young red pines were inoculated rhypodermically with conidial suspensions of *D. pullulans* and, after 5 weeks, the fungus was reisolated from sections of the stem 1 and 2 cm. from the site of inoculation. *D. pullulans* was found to contain a growth promoting substance by means of the lupine technic in a quantity exceeding that of other fungi tested. The theory is advanced that abnormal growth of a pine bud may be initiated through the action of a phytohormone produced by the fungus living within the tissues."

We have been cognizant of this situation with respect to red pine on our state forests, particularly in the central and southern parts of the state where it is more prevalent, but it does not appear to have become a silvicultural problem of major proportions. Reports from two of our district foresters who have had some experience with this condition may be pertinent.

District Forester I. S. Bowlby whose headquarters are at Bath, N. Y., in the southwestern part of the state, writes:

"We did not do any pruning job to remove this forking condition on red pine. However, in our pruning operations and thinning operations at the present time, the foreman makes it a point to remove all red pine with forked leaders. It is of no serious proportions in our plantations of good red pine."

District Forester C. E. Baker, with headquarters at Norwich, N. Y., in the south central portion of the state, made some rather extensive observations in his district and carried on some silvicultural operations with this condition in mind. He reports as follows:

"When I came into the district in the spring of 1930 I inherited a plantation of red pine on Chenango Area No. 1-A in the town of McDonough established in the fall of 1929, on a site which would have been a better spruce site. One of the first things I noticed about the plantation when it got to the stage where it was about 3 to 4 feet in height was this so-called bifurcation. Later on as our other plantations of red pine got to the point where they were 3 to 4 feet in height the same condition seemed to be noticed but I have always associated it more or less with red pine on perhaps site 2. I have not run into it very often on what I consider to be site 1 for red pine.

"As an experiment I used some men out of the McDonough CCC Camp to hand prune the bifurcated branch. This was done when the trees were somewhere between 4 to 5 feet in height. As the result of pruning this branch we seemed to get very little trouble and there never was much evidence after the pruning operation that the pruned tree had had any original difficulty.

"We run into the thing occasionally in our plantation thinning operations in red pine and in most cases the tree which had the bifurcation is eliminated along with other culls in the first thinning operation. I agree with you that bifurcation has not been anything which has caused us any serious trouble but it is one of the minor problems of red pine and anyone working in plantations has to recognize it. It is my opinion it is pretty closely tied up with site and of course red pine growing on the wrong site is like every other tree, subject to more maladies."

E. W. LITTLEFIELD
N. Y. State Conservation Department, Albany

[1]Carvell, Kenneth L. Summer shoots cause permanent damage to red pine. Jour. Forestry 54: 271. 1956.

[2]Jump, John Austin. A Study of forking in red pine. Phytopath. 28: 798-811.

[3]A new disturbance of red pine. Science (n.s) 87: 138-139. 1938.

The Osborne Tree Cone Cutting Knife

Foresters and seed collectors ordinarily determine seed content of tree cones by cutting sample cones longitudinally and counting the exposed seeds. The number of seeds per cone is a useful index to aid in selection of collecting areas or in establishing value for purchase of cones. Experience has demonstrated the need for a safer cutting tool than the pocket knife, machete, or axe ordinarily used.

A very satisfactory cutting knife (Fig. 1) has been developed by Harry Osborne, field supervisor at Sedro Woolley for the State of Washington Division of Forestry. It was used successfully in the 1955 cone collection season and can be recommended as a practical cone-cutting tool. Designed primarily for Douglas-fir it has also been used successfully on hemlock and ponderosa pine cones, although size of the latter prevents their fitting into the slotted pipe. There is reason to believe that the cutter would work on cones of many other species.

There are four parts to the cutter: (1) A pipe—diameter of which depends on the size of cones to be cut, ordinarily the minimum will be one inch; (2) knife blade; (3) wooden plug; (4) a stove bolt through the end of the blade and pipe to serve as a hinge or pivot point. The pipe is cut to shape with a hacksaw. Blades are made from discarded crosscut saws. To simplify shaping of the knife, the saw blades are softened by heating, and subsequently retempered after cutting and grinding to the desired shape.

In using the devise a cone is laid in the pipe and cut with the knife much as paper is cut in a paper cutter. The number of seeds exposed in one-half may then be easily counted.

Several modifications have been made by users of the tool. The most important is an addition of a protective covering over the handle portion of the blade. Since considerable pressure must be exerted to cut most cones, a wooden or metal covering attached to the back of the blade reduces the chance of bruised hands when the tool is used continuously. Lost time and tools can be prevented by drilling a hole through the handle and attaching a suitable cord.

Experience has demonstrated that the cutter is well suited for the purpose for which it was designed. It is easily carried, makes a good clean cut of cones, and virtually eliminates the hazards that exist when other tools are used for this purpose.

The tool is currently being manufor the State Division of Forestry in its Nursery shop. For additional information, or prints showing dimensions of the knife, (write) the State of Washington, Division of Forestry, 406 Transportation Building, Olympia, Washington.

DONALD R. HOPKINS
Ass't. Supervisor-Management
Division of Forestry
State of Washington

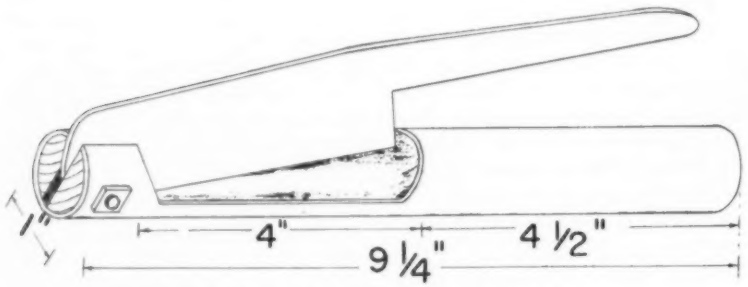

FIG. 1.—Drawing of the Osborne Cone Cutter.

Coming Events

New England Section Meeting

The New England Section will hold its summer meeting on September 6 and 7 at Orono, Maine.

Allegheny Section Meeting

The Allegheny Section of the S.A.F. will hold its meeting in Ocean City, Md., September 6-7, 1956.

Wisconsin-Michigan Section

The Wisconsin-Michigan Section will meet September 14-15 at Shawano, Wisc.

New York Section

The summer meeting of the New York Section will be held September 13 and 14 at Whitney Park, Sabbatis, N. Y.

Canadian Forestry Association

The Canadian Forestry Association will hold a National Forestry Conference in Winnipeg, Ontario, Canada, September 17-19, 1956.

Society of American Foresters Annual Meeting

Annual meeting of the Society of American Foresters will be held in Memphis, Tenn at the Peabody Hotel, October 14-17, 1956.

Reviews

Chemical Debarking of Some Pulpwood Species

Hugh Wilcox, F. J. Czabator, G. Girolami, D. F. Moreland, and R. F. Smith. 43 pp. Illus. State University of New York, College of Forestry, Syracuse, N. Y. 1956. 60 cents.

Rarely do research and practice of forestry come together so usefully and completely as they do in this timely bulletin by a team of research workers. This was a cooperative endeavor (known as the Chemical Debarking Research Project) between a group of pulp and paper companies and the College of Forestry.

The purpose of the investigation was to study some of the factors responsible for bark separation and to improve technical debarking practice. Chemical debarking is cheaper, more rapid, and less laborious than sap-peeling and much less wasteful than mechanical peeling.

After reviewing earlier experiments in chemical debarking, the publication analyzes the natural bark-peeling of trees. A bark-testing tool was devised and a scale of "peelability" adopted. Then came the cooperative experiments on commercial practices. Each cooperating company was assigned 400 to 600 trees of three or four species for treatment. Treatment was before, during, and after the sap-peeling season. In general treatment with arsenic compounds resulted in very poor peeling although the trees were killed. Conifers peeled best if treated immediately after the sap-peeling season began, but hardwood peeled best two or three weeks after the season began.

Of all the chemicals tested, a 40 percent solution of sodium arsenite was found most effective. Shallow-cut girdles were found the best means of application. Experiments show that the girdle should be as wide as the diameter of the tree being treated, and as low as possible.

The effect of chemical debarking on quality of pulp and paper produced is nil. For management and silviculture, it is a useful tool. In a special supplement by W. L. Webb, E. M. Rosasco, and S. V. R. Simkins of the College, the effect of chemical debarking on forest wildlife is found to be negligible if the poison is properly handled by trained crews.

A. B. Recknagel

From Forest to Front Page

By Roscoe C. Martin, 66 pp. Illus. University of Alabama Press, University, Ala. 1956. $1.25.

Foresters who want to learn more about the way our interlocking system of government and business works, and especially how it affected one of their largest customers, should read this book. Professor Martin reports on decisions made at many levels of administration in selecting Calhoun, Tenn. as the site of the world's largest single pulp and paper mill, the Bowater plant.

Complicated maneuvering, compromising and plain fighting between conflicting interests invariably accompany an undertaking of this scale whether it be public or private, and this case was no exception. Something may have been lost in objectivity by occasionally casting the principal protagonists —the United States Forest Service, Tennessee Valley Authority, and Bowaters Southern Paper Corporation—in the roles of villain, hero and damsel in distress, but this is probably more than compensated for by increased readability over the usual dry case history in administration.

TVA officials had long been convinced that a pulp and paper mill would greatly enhance the region's economic development. When Bowater showed interest the TVA's whole organization went to work to bring the new plant into the valley. The author concludes that there were fourteen factors in addition to TVA's efforts that finally determined selection of the Tennessee site. There is no attempt to examine the relative importance of these various factors from the standpoint of location theory in economics. This reviewer, at least, would have found such an analysis extremely interesting.

Bowater decided to build in 1951 when numerous government regulations were in force affecting new plant construction. If a certificate of necessity could be obtained it would be possible to write off a large part of new plant investment through speeded tax amortization. Only the Defense Production Administration had the authority to grant certificates, but recommendations were made by the National Production Authority of the Department of Commerce. The NPA in turn depended upon the Forest Service to advise it on whether timber supplies would be adequate to support a new plant without disrupting existing industries.

There were prolonged negotiations (nine months) in which Bowater and TVA foresters sought to obtain Forest Service approval of the Calhoun site. The Forest Service maintained that there was not enough pine in the proposed procurement area to support an additional plant using 300,000 cords per year. TVA and Bowater claimed that pine plantations and more intensive forest management would result in adequate wood without penalizing existing users. The certificate was finally granted through a compromise in which Bowater agreed to extend its buying area to include 29 counties

in Virginia and North Carolina.

Not enough data are presented for an outsider to judge the technical merits of this dispute although it is difficult not to blink one's eyes at the TVA foresters' optimism. But wasn't wood supply a minor matter in the actual determination of plant location in view of the other factors involved? The reader is not given enough information to be able to answer this question.

Markets were never a problem as newsprint was badly needed in the South. Southern newspapers were nearly unanimous in taking up Bowater's cause and a favorable press was certainly no handicap to the venture. The plant began operation with its entire production of newsprint on order for the next 15 years.

The study, financed by Resource for the Future as a case study in resources administration, is a contribution to the Inter-University Case Program.

SOLON BARRACLOUGH
University of Tennessee

Be Expert with Map and Compass

By Bjorn Kjellstrom. 136 pp. Illus. American Orienteering Service, New York 1, N. Y. 1955. $2.

The ability to read a compass correctly and apply this knowledge, with the aid of maps, so as to find one's way through the fields and woods is excitingly revealed in the *orienteering* handbook *Be Expert with Map and Compass.*

Orienteering is a new sport for everyone and is based on the understanding of how to use a map and compass. The author emphasizes the need for continued development of one's own powers of observation to supplement the compass and map for the purpose of orienteering through the woods. The graphic drawings and the use of simple problems, along with suggested field exercises, add to the explanation given in the main text.

After a brief introduction to this new sport, part one tells in a clear and interesting manner how a map is made. It also reveals how to read and use the map to obtain directions and distances by the use of symbols.

In the second section, the compass is described and the various types are discussed. The finding of given positions, and the following and tracing of lines are all simplified by the author.

The last section is devoted to the fun which can be had by combining the map with the compass for both indoor and outdoor enjoyment. The author further discusses the need for proper clothing and equipment in preparation for field and wilderness travel. The fundamental need to understand *declination* and its relationship to the reading of a compass is a must for those desiring to be expert.

This handbook is well illustrated by line drawings and has 10 pages of appendix. Its flexible cover is designed to readily be carried in pocket or packsack. It is especially suited for the Boy Scouts of America and their leaders, yet it will be found a most valuable and practical help for all those interested in cross-country travel of any kind and to those who wish a better understanding of the magic of the compass needle in pointing the way.

HENRY A. PLUMMER
Orono, Maine

Publications of Interest

The new 4th edition of *Forest Farmer Manual,* published by the Forest Farmers Association, covers all phases of southern forest land management from fire protection to taxation, cost accounting and a prediction of things to come timber-wise. Designed especially for the small owner and operator, this guidebook concentrates on conditions in the 15 southern states from Texas and Oklahoma to Virginia and West Virginia.

A feature of the new Manual, edited by J. Walter Myers, Jr., executive director of the Forest Farmers Association, is its presentation of up-to-date facts on the region's industrial and public forest agencies and the timber trade groups and associations. It carries rosters of lumber companies, of the pulp and paper companies, of railroad foresters, and of consulting foresters.

Issued primarily for the benefit of the membership of the Forest Farmers Association, the 4th *Forest Farmer Manual* is available at $3.50 a copy. It may be obtained through the Forest Farmers Association, P. O. Box 7284, Station C, Atlanta, Ga.

* * *

Forest industries whose operations involve disposal of contaminated waste waters will find suggested methods of stream-pollution prevention in March 1956 issue of *Wood Research,* a bimonthly publication of Timber Engineering Company, research affiliate of the National Lumber Manufacturers Association.

Four specific approaches to cleansing industrial waste waters are cited by Dr. Eduard Farber, chief chemist, and Donald V. Robertson, wood technologist, of the Teco laboratory, in the featured article, "Chemical and Biochemical Effluent Purification." These are (1) evaporation, (2) precipitation, (3) insolubilization, and (4) biological conversion.

Among these methods, the authors point out, are those being used by the pulp and paper industries, with considerable success, while the other approaches are suggested as having definite potentials in new purification methods.

Copies of the publication are available, without charge, from Dept. WR-24, Timber Engineering Company, 1319-18th Street, N.W., Washington 6, D. C.

* * *

Publication of a new lumber selling tool entitled *71 Home Projects in Wood* has been announced by the National Lumber Manufacturers Association.

Prepared for distribution by retailers, distributors, and manufacturers, the 96-page book provides complete instructions, working drawings and bills of materials for a variety of do-it-yourself projects designed to appeal to the do-it-yourself handyman. Priced at 35c with reduction for bulk orders from N.L.M.A., 1319 Eighteenth Street, N.W., Washington 6, D.C.

Current Literature

Compiled by MARTHA MEELIG, *Librarian, State University of New York College of Forestry*
Range Management Section Compiled by FRANCES FLICK, *Library, U. S. Department of Agriculture*

General

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Society Affairs

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1956-1957

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Annual Meeting

Society of American Foresters
Memphis, Tenn., October 15-17, 1956
Theme: "Forestry Faces Forward"

Schedule of Events

Members, their ladies, and guests who plan to attend the Society's 56th annual meeting are urged to arrive in Memphis on Sunday, October 14, or not later than the morning of Monday, October 15. The opening general session starts on Monday morning.

The following program for the various activities is up to date as of the time of going to press. The complete program will be published in the September issue.

General Meeting
Monday, October 15

E. L. Demmon, Chairman

Morning Session

Theme: "Forestry Faces Forward"

1. "Making the Most of the Southern Forest: the Opportunities, the Tasks." Joseph E. McCaffrey, International Paper Company, Mobile, Ala.
2. "Special Horizons in Hardwood Forestry." S. M. Nickey, Jr., Nickey Brothers, Inc., Memphis, Tenn.
3. "Opportunities and Problems in Utilizing Wood Products of the Southern and Southcentral Forests." J. Alfred Hall, U. S. Forest Products Laboratory, Madison, Wis.

Society Affairs Session
Monday, October 15

DeWitt Nelson, President

George A. Garratt, Vice President

Henry Clepper, Executive Secretary

Afternon Session

1. Report of the President, DeWitt Nelson.
2. Report of the Executive Secretary, Henry Clepper.
3. Report of the Editor of Society Publications, Arthur B. Meyer.
4. Report of the Editor of *Forest Science*, Stephen H. Spurr.
5. Report of the Special Committee on State Registration of Foresters, Julius Kahn, chairman.
6. Report of the Special Committee on Public Relations, C. W. Mattison, chairman.
7. Discussions by the Council and Section delegates:

   Proposed increases in dues (now $6) for Affiliate Members and Associate Members.

   Possible elimination of Bylaw 75 which provides for Associate Members of Sections who are not members of the Society.
8. Other Committee reports.
9. Open forum discussion of Society affairs.

Division of Forest Recreation
Monday, October 15

Donald P. Duncan, Chairman
James P. Gilligan, Vice Chairman
Felix Koziol, Secretary

Evening Session

1. "Mission 66—The National Park System in 1966." Conrad L. Wirth, National Park Service, Washington, D. C.
2. "Problems in Planning for the 1960 Winter Olympics." J. M. Herbert, Division of Recreation and Lands, U. S. Forest Service, Washington, D. C.
3. "Research into the Human Element in Wilderness Use." Marvin Taves and Gregory Stone, Department of Sociology, University of Minnesota, Minneapolis, Minn.
4. "Research Needs in Forest Recreation." Samuel T. Dana, School of Natural Resources, University of Michigan, Ann Arbor, Mich.

Division of Range Management

Monday, October 15

Bert H. Tucker, Chairman
Elbert H. Reid, Vice Chairman
John T. Cassady, Secretary

Evening Session

1. Panel discussion: "The Place and Function of the Division of Range Management in the Society of American Foresters."

Moderator: Lincoln Ellison, Intermountain Forest and Range Experiment Station, Ogden, Utah.

Panel:

DeWitt Nelson, California, Department of Natural Resources, Sacramento, Calif.

Robert S. Campbell, Southern Forest Experiment Station, New Orleans, La.

Milo H. Deming, Bureau of Land Management, U. S. Department of the Interior, Salt Lake City, Utah.

2. "Supplemental Feeding of Cattle on Forest Ranges in the South." John T. Cassady, Southern Forest Experiment Station, Alexandria, La., and Lowell K. Halls, Southeastern Forest Experiment Station, Tifton, Ga.

3. "New Developments in Chemical Brush Control." Hurlon C. Ray, Soil Conservation Service, Fayetteville, Ark.

4. Business Meeting.

Division of Education

Monday, October 15

W. F. McCulloch, Chairman
David M. Smith, Vice Chairman
A. Bigler Crow, Secretary
Wilbur B. DeVall, Program Chairman

Evening Session

Theme: "Regional Planning for Forestry Education in the South"

1. "Objectives of Regional Planning: the Committee at Work." Clarence F. Korstian, School of Forestry, Duke University, Durham, N. C.

2. "Activities of a Regional Council." Winfred L. Godwin, Southern Regional Education Board, Atlanta, Georgia.

3. "Preforestry Training and Transfer within the Region." Alfred D. Folweiler, Texas Forest Service, College Station, Texas.

4. "Recruitment Efforts in the South." Clemens M. Kaufman, School of Forestry, University of Florida, Gainesville, Fla.

5. "Extending Regional Planning to Pulp and Paper Technology." Richard J. Preston, School of Forestry, North Carolina State College, Raleigh, N. C.

Russell Stadelman
General Chairman for the Annual Meeting

Division of Private Forestry

Monday, October 15

Arthur W. Nelson, Chairman
William C. MacAdam, Vice Chairman
Sulo V. Sihvonen, Secretary

Evening Session

1. "Let's Cut One for Ourselves! The Outline of a New Idea: a Forestry Company of, by, and for Foresters." Harry Nadler, K-T Forestry Company, Inc., Pineville, Ky.

2. "The Development of Hardwood Forests on Private Lands in the South." John W. Squires, Mississippi Products, Inc., Jackson, Miss.

3. "Natural Areas for Private Forestry." John F. Shanklin, Committee on Natural Areas, Society of American Foresters, Washington, D. C.

4. "The Selection and Training of Foresters for Executive and Managerial Positions."

Comments. George A. Garratt, School of Forestry, Yale University, New Haven, Conn.

Division of Silviculture

Tuesday, October 16

Carl Ostrom, Chairman
Henry I. Baldwin, Vice Chairman
Leon H. Chaiken, Secretary

Morning Session

1. "Opportunities and Problems in the Silviculture of Southern Hardwoods." John A. Putnam, Southern Forest Experiment Station, Stoneville, Miss.

2. "Insects and Diseases in Southern Hardwoods." Robert C. Morris and Richard E. Toole, Southern Forest Experiment Station, Stoneville, Miss.

3. "Variation in Hardwood Growth Rate Attributable to Species and Sites." Thomas C. Nelson, Southeastern Forest Experiment Station, Athens, Ga., and William R. Beaufait, Southern Forest Experiment Station, Stoneville, Miss.

4. "Improvement of Southern Hardwood Stands Through Commerical Harvest or Noncommercial Deadening." J. Scott McWilliams, Union Producing Company, Monroe, La., and J. Sidney McKnight, Southern Forest Experiment Station, Stoneville, Miss.

5. "Silvics and Silviculture of the Most Primitive Hardwoods—Cottonwood and Willow." Carl Maisenhelder, Southern Forest Experiment Station, Stoneville, Miss., and Charles Heavrin, Anderson-Tully Lumber Company, Dyersburg, Tenn.

6. "Future Improvement in Southern Hardwood Quality and Yield Through Genetics." E. G. Wiesehuegel, Tennessee Valley Authority, Knoxville, Tenn.

Afternoon Session

1. "Some Analytical Techniques for Tree Race Studies." Howard R. Kriebel, Department of Forestry, Ohio Agricultural Experiment Station, Wooster, Ohio.

2. "Weekly Diameter Growth of Shortleaf Pine and White Oak as Related to Soil Moisture." William R. Boggess, Dixon Springs Experiment Station, University of Illinois, Robbs, Ill.

3. "Some Factors in Seedling Survival Near the West Margin of the Southern Pine Belt." Edwin R. Ferguson, Southern Forest Experiment Station, Nacogdoches, Tex.

4. "Administrative and Technical Aspects of Establishing Pine Seed Orchards." L. A. Hargreaves, Jr., Georgia Forestry Commission, Atlanta, Ga., and Keith W. Dorman, Southeastern Forest Experiment Station, Macon, Ga.

5. "Prescribed Burning in the Silviculture and Management of Southern Pine-Hardwood and Slash Pine Stands." T. H. Silker, Texas Forest Service, Kirbyville, Tex.

Division of Watershed Management

Tuesday, October 16

Robert E. Dils, Chairman
Howard W. Lull, Vice Chairman
E. A. Johnson, Secretary

Morning Session

1. "Woodlands Part and Foresters' Opportunities in Small Watershed Improvement." George R. Phillips, Soil Conservation Service, Washington, D. C.

2. "Evapo-Transpiration and Water Yields Following Forest Cutting and Natural Regrowth." Jacob Kovner, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.

3. "The Chestuee Watershed Project in Lower East Tennessee." Homer A. Smith, Tennessee Valley Authority, Athens, Tenn.

4. "Watershed Management on National Forests of the South." C. Otto Lindh, U. S. Forest Service, Atlanta, Ga.

5. "What's Ahead for Watershed Management Research." V. L. Harper, U. S. Forest Service, Washington, D. C.

6. Business meeting.

Report of the Committee on Hydrologic Training Needs of Foresters. Harold G. Wilm, College of Forestry, Syracuse, N. Y.

Division of Economics and Policy

Tuesday, October 16

Albert C. Worrell, Chairman
Arthur S. Todd, Jr., Vice Chairman
Carl H. Stoltenberg, Secretary

Afternoon Session

1. "Intensive Management Can Be Profitable in the South." R. R. Reynolds, Southern Forest Experiment Station, Crossett, Ark.

2. "Planning Forest Production from the Individual Land Owner's Point of View." Solon L. Barraclough, Ames Plantation, University of Tennessee, Grand Junction, Tenn.

3. "Date Needs, Sources, and Deficiencies for Input-Output Analysis in Forestry." Thomas G. Herndon, School of Forestry, University of Florida, Gainesville, Fla.

4. "Effect of Government Programs on Timber Production in the South." Robert K. Winters, Division of Forest Economics Research, U. S. Forest Service, Washington, D. C.

5. "Some Likely Effects of Closer Utilization on the Supply of Southern Stumpage." Walter C. Anderson, Southeastern Forest Experiment Station, Asheville, N. C.

6. "Stumpage Price Reports as a Stimulus to Timber Growing." Sam Guttenberg, Southern Forest Experiment Station, New Orleans, La.

7. "Stumpage Prices as a Production Guide in Forestry." Carl H. Stoltenberg, Northeastern Forest Experiment Station, Upper Darby, Pa.

Division of Forest Products

Tuesday, October 16

Russell Stadelman, Chairman
Stephen B. Preston, Vice Chairman
Harry E. Troxell, Secretary

Afternoon Session

1. "Utilization—The Key to Better Forestry at Crossett." S. V. Sihvonen, Crossett Forestry Division, Crossett, Ark.

2. "Five-Year Trend in Circular Sawmill Operations in the Tennessee Valley." John W. Lehman, Tennessee Valley Authority, Norris, Tenn.

3. "Research on Hardwoods for Pulp and Paper." Robert J. Seidl, Forest Products Laboratory, Madison, Wis.

4. "Flotation Logging." George C. Lucas, May Brothers, Inc., Garden City, La.

5. "New Developments in the Veneer and Plywood Industry in the South." Walton R. Smith, Southeastern Forest Experiment Station, Asheville, N. C.

Comments. James S. Bethel, North Carolina State College, Raleigh, N. C.

Division of Forest Management

Wednesday, October 17

J. Walter Myers, Chairman
Gerald S. Wheeler, Vice Chairman
B. E. Allen, Secretary

Morning Session

1. "Continuous Forest Inventory as a Guide to Management." George W. Abel, St. Regis Paper Company, Jacksonville, Fla.

Discussion.

2. "Inventory Analysis—First Aid to Hardwood Management." Charles L. Tebbe, U. S. Forest Service, Upper Darby, Pa.

Discussion.

3. "The Consulting Forester's Role in Developing Better Management on Small Tracts." Charles R. Page, Jr., Consulting Forester, Chattanooga, Tenn.

Discussion.

4. "Managing Forests under a Tree Farm Family Program." Richard C. Allen, A. DeWeese Lumber Company, Inc., Philadelphia, Miss.

Discussion.

5. "The Place of Hardwoods in Forest Management for Pulpwood." John W. Johnson, Union Bag & Paper Corporation, Savannah, Ga.

Discussion.

Afternoon Session

1. "Relation of Forest Management to the Insect Problems in the South." R. Joseph Kowal, Southeastern Forest Experiment Station, Asheville, N. C.

Discussion.

2. "The Place of Prescribed Burning in Protecting the Forest." William M. Oettmeier, Superior Pine Products Company, Fargo, Ga.

Discussion.

3. "Forest Fire Insurance as it Affects Forest Management and Fire Control Activities." Monroe F. Greene, Seibels, Bruce & Company, Columbia, S. C.

Discussion.

4. "Forest Fire Research—What it Can Offer Forest Management." V. L. Harper, U. S. Forest Service, Washington, D. C.

Discussion.

5. "Summing Up the Presentations of the Division of Forest Management." John W. Squires, Mississippi Products, Inc., Jackson, Miss.

6. Business session.

Division of Public Relations

Wednesday, October 17

Charles W. Mattison, Chairman
Fred E. Winch, Jr., Vice Chairman
J. Walter Myers, Jr., Secretary

Morning Session

Panel Discussion: The Small Forest Landowner—Keystone and Enigma In Forestry. A discussion of how best to reach this owner through education.

Moderator: Richard J. Preston, School of Forestry, North Carolina State College, Raleigh, N. C.

Panel:

Charles H. Flory, State Commission of Forestry, Columbia, S. C.

Henry J. Malsberger, Southern Pulpwood Conservation Association, Atlanta, Ga.

Herman E. Baggenstoss, *Grundy County Herald*, Tracy City, Tenn.

James W. Craig, Forestry Suppliers, Inc., Jackson, Miss.

Division of Forest-Wildlife Management

Wednesday, October 17

Ralph T. King, Chairman
Avon Denham, Vice Chairman
C. Frank Brockman, Secretary
Howard A. Miller, Program Chairman

Afternoon Session

1. "Coordinated Forestry, Farm and Wildlife Programs for Family Sized Farms of the Coastal Plain of the Deep Southeast." Herbert Stoddard, Sr., Sherwood Plantation, Thomasville, Ga.

Comments. Frank Heyward, Gaylord Container Corporation, Bogalusa, La.

2. "Game as a Product of Intensively Managed Forests." Hubert D. Burke and Robert M. Blair, Southern Forest Experiment Station, New Orleans, La.

Comments. N. W. Sentell, Southern Advance Bag and Paper Division of Robert Gair Company, Hodge, La.

3. "Importance of Southern Bottomland Hardwoods in Wildlife Management." Bryant A. Bateman, School of Forestry, Louisiana State University, Baton Rouge, La.

Comments. Harry Clark, Fisher Lumber Company, Wisner, La.

4. "Effect of Siltation on Trout Streams." Lee B. Tebo, Sr., Wildlife Resources Commission, Raleigh, N. C.

Comments. Thomas C. Nelson, Athens-Macon Research Center, Athens, Ga.

5. "Deer and Turkey in Missouri's Managed Forests." Robert L. Dunkeson, Missouri Conservation Commission, Columbia, Mo.

Comments. Leon Hornkohl, Missouri National Forests, Rolla, Mo.

The Annual Dinner

Wednesday Evening, October 17

George A. Garratt, Toastmaster

Award of the Sir William Schlich Memorial Medal.

Award of the Gifford Pinchot Medal.

First awards by the Society of American Foresters for outstanding achievement in biological research contributing to the advancement of forestry.

Address by Hodding Carter, editor of the *Delta Democrat Times*, Greenville, Miss.

Entertainment.

Social Evening

Tuesday evening, October 16, will be devoted to social activities, centering around "A Night on Beale Street." All members, their ladies, and guests are cordially invited. About this evening, more later.

Ladies' Activities

Monday, October 15. A special 35-mile tour of Memphis and the levee by bus, leaving the Peabody Hotel at 11 a.m. The ladies will call at the Nickey-Eason plantation, visit a cotton gin, and see cotton being picked in the field. A barbecue luncheon will be served. Return to the hotel about 4 p.m.

Tuesday, October 16. The ladies forestry forum will be held in the morning with Miss Alma Deane Fuller as the speaker. Forestry motion pictures will be shown. Brunch will be served. There will be special activities during the evening.

Wednesday, October 17. A tour has been arranged, leaving the Peabody Hotel at 11 a.m., to the city hospital center, Brooks' Art Gallery, and other places of interest. Luncheon will be served at the Memphis Country Club, and a fashion show will be featured. Return to the hotel about 3 p.m. On Wednesday evening the Society's annual dinner will be served in the Peabody Hotel. All ladies are invited.

Field Trips

Postmeeting field trips to places of interest are being arranged for Thursday and Friday, October 18 and 19. Details will be announced next month.

Hotel Reservations

Those expecting to attend the meeting are urged to arrive in Memphis on Sunday, October 14, or not later than Monday morning, October 15. The first general session starts on Monday morning.

The Peabody Hotel will be the headquarters for the meeting. The Peabody has 625 rooms, but it will not be able to accommodate all those in attendance, hence other hotels are making space available.

However, all members who desire to stay at the headquarters hotel should send their reservations direct to the Peabody. Assignments will be made at, or as near, the desired rate as possible. Requests for rooms will be fillled by the Peabody in the order of their receipt until the number of rooms available has been exhausted. The Peabody will then refer reservations that it cannot fill to other cooperating hotels.

The reservation coupon printed on the next page may be used. Readers who do not want to cut the coupon from their Journals may request reservations by letter by providing all the information listed on the coupon.

As is usual, single rooms may be scarce, hence when possible twin bed rooms should be requested.

Members who prefer hotels other than the Peabody may write them direct, being sure to state that the reservations requested are for the meeting of the Society of American Foresters.

Hotels

Peabody Hotel, 149 Union Avenue, Memphis 1, Tenn. Single rooms, $4.50 to $11; double-bed rooms for two, $6.50 to $13; twin-bed rooms, $9 to $15; suites $19 to $35. All rooms have baths.

Chisca Hotel, Main and Linden Streets, (zone 1); 400 rooms, all with baths. $4.25 up.

Claridge Hotel, Main and Adams Streets, (zone 4); 400 rooms. $4 up.

Gayoso Hotel, 139 Main Street, (zone 1); 200 rooms. $3.50 up.

King Cotton Hotel, Jefferson at Front Street, (zone 1). $4.75 up.

Parkview Hotel, Poplar Boulevard at Overton Park, (zone 1); 400 rooms. $4 up.

Wm. Len Hotel, Main and Monroe Streets (zone 3); 250 rooms. $3.50 up.

Motels and Tourist Courts

There are a number of motels and tourist courts in and near Memphis. Those wishing this type of accommodation may obtain a list of them, together with their rates and locations, from the Memphis Chamber of Commerce, P. O. Box 224, Memphis, Tenn.

Usually an advance deposit is necessary to hold a reservation at a motel or tourist court.

Committees for the Meeting

Russell Stadelman is general chairman for the meeting. His address is Nickey Brothers, Inc., 2700 Summer Avenue, Memphis 12, Tenn.

Assisting him are the following committees and their personnel.

Program Committee

Philip A. Briegleb is chairman of the Program Committee. His address is Southern Forest Experiment Station, 704 Lowich Building, 2026 St. Charles Avenue, New Orleans 13, La.

The other members of the committee are Glen R. Durrell, Richard Kilbourne, Charles H. Kirk, and Harrod B. Newland.

Committee on Arrangements

George C. Romeiser is chairman ot the Committee on Arrangements. His address is Southern Hardwood Producers, Inc., 805 Sterick Building, Memphis, Tenn. The vice chairman is Wharton J. Hawkins.

The following special assignments have been made to the Committee on Arrangements.

SOCIETY OF AMERICAN FORESTERS
ANNUAL MEETING
Memphis, Tenn. October 15-17, 1956

_____, 1956

Reservations Clerk,

Peabody Hotel,

149 Union Avenue,

Memphis 1, Tenn.

Second Choice Hotel _____

Third Choice Hotel _____

Please make a reservation for the following room accommodations for

arrival on October _____, a.m. / p.m. Departure date, October _____.

I understand that accommodations will be provided at the daily rate specified, if available; otherwise the next nearest rate will apply.

_____ Single room with bath. Rate, $ _____.

_____ Double-bed room with bath. Rate, $ _____.

_____ Twin-bed room with bath. Rate, $ _____

_____ Suite (parlor, twin-bed room, and bath). Rate, $ _____.

_____ Other. (Specify accommodations desired.) _____

_____. Rate, $ _____.

The above room accommodations are requested for the following persons, in addition to myself. (Print or typewrite names and addresses legibly.)

_____

_____

_____

My name: _____

Street address: _____

City, zone, state: _____

Information and Publicity. James O. Artman.

Registration and Welcome. John W. Lehman.

The Annual Dinner. C. F. Grafton.

Field Trips. John A. Putnam, Carl I. Peterson.

Meeting and Conference Rooms. Richard L. Burkhart.

Projection and Amplifying Equipment. Douglas E. Berlin,

Hotel Reservations and Housing. Robert P. Burton, Jr.

Exhibits. William W. May.

Ladies Activities. Mrs. W. Jeter Eason.

Social Night. A. K. Dexter, William T. Hawkins.

The President's Column

DEWITT NELSON

Last month I asked an old timer, Phil Coolidge, to give us his appraisal of the Society's annual meetings. This month I have invited Carl Wilson, who attended his first meeting in Portland last October to give us his impressions. As one who has had the privilege of attending many annual sessions of the Society I can underscore every point that Carl makes.

Here is his reply to my inquiry:

"As you know, I attended my first national meeting of the Society at Portland in 1955. It was the high point of my professional forestry career.

"The trip was worthwhile for a number of reasons. First, I enjoyed attending the joint meeting between the Council and Section officers at which I represented the Southern California Section. The lively exchange of ideas among the sections and the competitive though cooperative approach to the solution of mutual problems were inspiring to me.

"The Timber Resource Review speech by Chief McArdle on the first day opened the session with a challenging note. Naturally, it was impossible to attend all the meetings sponsored by the various Divisions. However, there were times when I wished I could have been twins or triplets. The interest was so great in several of the sessions that even standing room was at a premium. I was amazed by the large amount of work which obviously had gone into the papers. The talks weren't given 'off the cuff' but reflected many hours of thoughtful preparation.

"I would be remiss if I failed to mention how much I enjoyed the alumni luncheons (fortunately, I could attend two). The pleasant reunions with former classmates, coworkers, and many other friends would have been compensation enough for the trip.

"The Society dinner, of course, topped off an excellent meeting. It was an opportunity to eat some good food, hear a fine speech and to roar with laughter over the farce perpetrated by the noted Swedish Forester, Dr. Sven Halvar Haldaquist.

"The Forest Industries tour to Long-

view, Washington could have been an anticlimax to a successful meeting, but wasn't. To be frank, I was a little skeptical about being shown anything new in utilization. After seeing the chips, bark, slabs, cull logs, shavings, and other 'waste products' being utilized at a profit, I came away with an optimistic feeling over the future of all forest industries. It looks like they'll be using everything except the undercut in a few years.

"But in the final analysis, the friendships made and renewed in the hotel lobby, in the corridors and on the street corners convinced me that forestry is still the best profession, and foresters the finest folks on earth.

"These are some of the reasons why I am anxious to go to the next annual meeting."

/s/ CARL C. WILSON

Biographical Sketch,
Carl C. Wilson

Forester (Fire Research), California Forest and Range Experiment Station.

Born—Halfway, Oregon, March 17, 1915.

Graduated Nampa High School, Nampa, Idaho, 1933.

B.S. Forestry, University of Idaho, 1939.

M.S. Forestry, University of California, 1941.

Started forestry career as CCC enrollee in Idaho in 1933.

Summer work in national forests of California, Montana, and Utah from 1936 to 1941.

Alaska Highway project and U. S. Navy from 1942 to 1946.

Administration and fire control on Lassen, Plumas, and Angeles National Forests from 1946 to 1955.

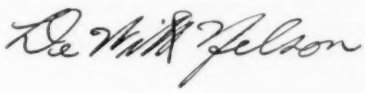
Division of Fire Research, California Forest and Range Experiment Station, Berkeley, California effective January 1, 1956.

S.A.F. Activities:
Junior Member—1942.
Member—1948.
Vice Chairman, 1954-1955 and Chairman, 1955-1956 of southern California Section.

Family:
Wife and two children, ages seven and nine.

* * *

The annual meeting is instructional, inspirational, and delightful. Make your plans now to see us in Memphis in October.



Northern Rocky Mountain Section Spring Meeting

Forester members, wives, and guests of the Northern Rocky Mountain section of the S.A.F. highlighted their successful annual spring meeting, concerned with multiple use of the natural resources of the South Fork of the Flathead, by a bus trip on Saturday, May 19, to Hungry Horse Dam and part of the forests around the reservoir. A number of technical discussions at Kalispell on Friday introduced the complex problem involved in management of this important area.

Assistant Regional Forester, R. U. Harmon, U. S. Forest Service, Region One, began the Friday session with a resume of all the resources involved.

School Box Score 1956 Membership

School	Student applications received: Aug. 1956	Total 1955	Total 1956
Alabama Polytechnic Institute	0	18	6
University of California	0	17	34
Colorado A & M College	1	9	23
Duke University	0	3	4
University of Florida	1	17	5
University of Georgia	6	28	21
University of Idaho	0	4	18
Iowa State College	1	22	14
Louisiana Polytechnic Institute	0	13	12
Louisiana State University	1	43	13
University of Maine	2	12	13
University of Massachusetts	0	11	13
Michigan State University	0	14	26
University of Michigan	0	21	18
University of Minnesota	1	19	26
University of Missouri	0	26	1
Montana State University	0	25	17
State University of New York	0	23	37
North Carolina State College	0	22	3
Oregon State College	2	38	31
Pennsylvania State University	0	32	19
Purdue University	0	24	16
Utah State Agricultural College	0	12	7
University of Washington	1	28	14
West Virginia University	1	26	4
Yale University	1	16	13
Totals	18	523	408

Section Box Score 1956 Membership

Section	Applications received[1]: Aug. 1956	Total 1955	Total 1956
Allegheny	3	63	40
Appalachian	0	38	21
Central Rocky Mountain	1	12	25
Central States	0	44	19
Columbia River	3	100	57
Gulf States	2	107	45
Inland Empire	0	10	35
Intermountain	0	18	14
Kentucky-Tennessee	0	9	7
New England	4	50	54
New York	0	33	40
Northern California	2	33	45
Northern Rocky Mountain	0	44	24
Ozark	0	47	12
Puget Sound	2	65	35
Southeastern	10	85	59
Southern California	0	3	1
Southwestern	0	12	0
Upper-Mississippi Valley	5	51	50
Washington	0	2	1
Wisconsin-Michigan	2	40	66
Totals	34	866	640

[1]Students, Junior, Affiliate, Associate (Initial) grades only.

He considered four general categories for management purposes: (1) The Bob Marshall wilderness area, (2) the remaining drainage area occupied by commercial forests and other watershed lands, (3) the reservoir and shore line which includes important recreational areas and future summer home sites, and (4) Hungry Horse Dam and the administrative site.

William Hornby, Kalispell Lumber Company, followed with a talk on the importance of the timber in the South Fork area to the economy of Flathead County.

Recreation, the third ranking industry in Montana, was considered in relation to the other uses in the South Fork by W. Leslie Pengelly of the Conservation Education Extension Service, Montana State University. He considered that good land management ordinarily is compatible with good wildlife management. However, quality hunting, hiking, and fishing are usually associated with undeveloped wilderness areas. Therefore the wild areas furnish a unique product.

After a 6:30 p.m. dinner at the Temple Tea Room, Miller Evans, Division of Operations and Maintenance, Bonneville Power Administration described the Hungry Horse Dam. Power and flood control are the two principal benefits of the dam.

On Saturday, the 75 people comprising the group were escorted through the Hungry Horse Dam and power house by Bureau of Reclamation guides.

At the next stop, Kenneth N. Boe, Research Forester, Intermountain Forest and Range Experiment Station, explained the silvicultural research at Coram Experimental Forest.

Assistant Ranger John Brinkerhoff, Coram Ranger Station, discussed timber sales and plans at two other stops.

Future recreational and timber production plans were discussed by Ranger Charlie Shaw of the Spotted Bear District.

During the noon luncheon, Northern Rocky Mountain Section Chairman Edward F. Barry, supervisor, Lolo National Forest, installed officers for 1957. Paul E. Bruns, consulting forester, is the new chairman; George R. Fahnestock, research forester, Intermountain Forest and Range Experiment Station, became vice-chairman; Franklin H. Blackmer, safety officer, Forest Service, Region One, is secretary-treasurer; and Vernon O. Hamre, staff officer, Bitterroot National Forest is nonresident member of the executive board.

The program was planned by Paul E. Neff, logging engineer, Forest Service Region One, and committee. George F. Weyermann, staff officer, Flathead National Forest, made all local arrangements.

Kentucky-Tennessee Section Holds Summer Meeting

The summer meeting of the Kentucky-Tennessee Section was held June 1 and 2 in Johnson City, Tenn. It was attended by sixty members and guests.

The first day was devoted to tours of the Harris Manufacturing Company of Johnson City, a plant making oak flooring; the Beau Knit Mills, manufacturers of rayon from wood pulp; and the Tri-State Container Corp., both of Elizabethton.

At the Section dinner held in the John Sevier Hotel, John Spring served as toastmaster. Among the speakers were Henry Clepper, who discussed Society affairs. Russell Stadelman, general chairman for the Society's 1956 meeting to be held in Memphis, outlined plans for the convention. A. K. Dexter, chairman for the social evening scheduled for October 16, reported on arrangements. Nat Winston of Johnson City, well known conservationist, was the principal speaker. John W. Lehman, Section chairman, presided over a brief business session.

On the second day, the members drove to Roan Mountain where D. J. Morriss, supervisor of the North Carolina National Forests, explained the ecology of this interesting botanical area and conducted a tour of spruce-fir Christmas tree management. The meeting adjourned after a box luncheon.

Meeting of Southern California Section

Thirty eight members and guests were present for the dinner meeting of the Southern California Section, June 13, 1956, held at the Green Hotel in Pasadena. Chairman Robert H. Parsons called the meeting to order and asked Ralph Van Wagner to report for the nominating committee. The following slate of candidates was presented:

Chairman, David Rogers.

Vice chairmen, Alvin Wright and Oliver Holmes.

Secretary-treasurer, Lynn Biddison.

There were no further nominations.

Vice Chairman Van Wagner introduced DeWitt Nelson, president of the Society. Mr. Nelson spoke on the organization of the Society and compared the Southern California Section to some of the other Sections in the United States. Mr. Nelson stated, "Nowhere in the country do so many people depend on so few foresters for so much as do the people of Southern California."

Walter J. Puhn made a motion which was seconded by Russell Ireland to write a letter to Colonel Arthur Fischer congratulating him on his retirement. Colonel Ficher has made many outstanding contributions to forestry during his illustrious career.

The meeting was adjourned at 10 p.m.

LYNN R. BIDDISON
Secretary-Treasurer

New York Section to Meet

The summer meeting of the New York Section will be a novel affair for New York foresters. A field meeting, including an overnight camp will be held on Whitney Park in the Central Adirondack region September 13 and 14.

The field trip, involving transportation by boat and foot for many, and airplane travel for a few, will cover points of interest on Whitney Park lands eventually ending at the remote Salmon Lake campsite for an overnight stay. A steak roast and tall tales around the fire will feature the evening.

Whitney Park is one of the earliest areas in the country to be placed under forest management. Gifford Pinchot and Henry S. Graves drew up the first plan for this large tract just before the turn of the century. The estate covers approximately 69,000 acres. In this original management plan, as in the one for Na-ha-se-ne Park, some of the first practical rules developed in American forestry were applied to an actively managed forest area.

Today this tract continues to be managed under the ownership of William C. Whitney's heirs and the watchful eye of John R. Curry, general manager, and former U. S. Forest Service veteran.

The program chairman for the summer meeting will be Thomas W. Church, a forester with Whitney Industries, Inc. He advises that among the points of interest to be covered by the field trip will be a 50-year old balsam stand developed following fire and now being harvested, areas of stand improvement work on softwood sites, a current northern hardwood logging operation, areas and structures related to fish management, and pole hardwood stands developed after fire and cutting.

S.A.F. Consulting Foresters Directory to Be Published

Persons and firms listed in the S.A.F. Consulting Foresters Directory, published in the January, 1956 JOURNAL OF FORESTRY, have been requested by mail to approve, correct, or revise their listings for the new directory to be published in the January, 1957 JOURNAL.

Members doing consulting forestry work and whose names have not previously appeared are invited to apply now for listing. They should provide complete information following the form used in the List of Consulting Foresters published in the January, 1956 JOURNAL OF FORESTRY. Society membership is a prerequisite for listing. Consulting firms will be listed if one or more of the partners or employees are members of the Society.

November 1, 1956 is the last date on which listings will be accepted for publication in the January, 1957 directory.

Membership Applications and Advancements

Proposals for admission, advancement, and reinstatements received in the Society office during the month of June are listed below.

Action on the eligibility of those proposed for membership as listed below will be taken by the Council as of September 1, 1956. Communications from voting members regarding the membership eligibility of these persons should be received in the Society office prior to that date.

Allegheny Section

Student Grade

WEST VIRGINIA UNIVERSITY

Herman, R. J.

Junior Grade

Zeutzius, H. G., Service Forester, Pa. Dept. of Forests & Waters, Norristown, Pa.; Pa. State, B.S.F., 1953.

Students Eligible for Automatic Advancement

PENNSYLVANIA STATE UNIVERSITY

Anundson, D. E.	Kaminski, J. S.
Bailey, S. A.	Krivak, J. M.
Bergey, H. T.	Lantz, P. M.
Bommer, R. H.	Leasure, J. A.
Caton, P. E.	Megargel, M. W.
Cowan, R. L.	Orvis, L.
Cromley, D. L.	Primozic, F. R.
Ellis, T. G.	Reinsel, E. N.
Fenstermaker, F. L.	Robertshaw, N. F.
Frank, R. L.	Wallace, R. G.
Ifft, J. A.	

WEST VIRGINIA UNIVERSITY

Baker, J. K.	Petruccelli, M. E.
Bond, D. L.	Pickens, R. W.
Hayfield, W. E.	Ware, K. D.
Kaunike, R. L.	West, J. L.
Medvick, C.	

Associate Grade

O'Hara, E. F., Vice-President, Armstrong Forest Co., Johnsonburg, Pa.

Appalachian Section

Junior Grade

Students Eligible for Automatic Advancement

DUKE UNIVERSITY

Douglas, C. R.	Heeren, R. D.
French, W. E.	Hudson, M. D.
Goforth, M. H.	Landgraf, A. E.

Member Grade

Allen, R. M., Forester, U.S.F.S., Durham, N. C. (Junior, 1948).

Ebert, J. B., Consulting Forester, 814 Louise Circle, Durham, N. C. (Junior, 1949).

Central Rocky Mountain Section

Student Grade

COLORADO A & M COLLEGE

Kledt, H. A.

Junior Grade

Students Eligible for Automatic Advancement

COLORADO A & M COLLEGE

Chappelle, D. E.	Kledt, H. A.
Cole, W. Q.	LaMay, T. W.
Cousineau, W. D.	Sheppard, S. R.
Ericson, J. E.	Tice, R. W.

Central States Section

Junior Grade

Students Eligible for Automatic Advancement

PURDUE UNIVERSITY

Barnacastle, R. C.	Killian, W. W.
Bickel, D. R.	Kodrich, M. R.
Butler, R. E.	Koenig, R. W.
Chilman, K. C.	Miller, R. E.
Clemmons, J. W.	Pierson, G. P.
Colyer, J. A.	Pryor, R. L.
Dzur, R. G.	Skrip, R. M.
Herberg, R. O.	Smith, R. N.
Huddleston, C. R.	Thomas, J. E.
Keesler, D. C.	Thompson, J. G.

Columbia River Section

Student Grade

OREGON STATE COLLEGE

Franks, W. R.	Kelly, G. W.

Junior Grade

TerBush, F. A., Field Representative, Western Forest Industries Assoc., Roseburg, Ore. Reinstatement.

Students Eligible for Automatic Advancement

OREGON STATE COLLEGE

Barr, G. E.	Leonard, G. M.
Carlson, A. D.	Madison, R. W.
Carter, J. K.	Maher, D. G.
Christiansen, D. R.	Mitchell, R. G.
Cobo, E. T.	Morris, R. M.
Collins, J. G.	Overbay, J. C.
Cone, J. B.	Page, F. E.
Crawford, S. B.	Pitts, D. W.
Davies, W. G.	Sikora, C. V.
Ebner, T. J.	Smith, D. H.
Ertel, R. L.	Smith, P. C.
Flenner, R. G.	Swanson, C. L.
Hoyt, J. V.	Thompson, A. G.
Johnson, D. K.	Tomlin, G. W.
Johnson, R. O.	Toney, R. D.
Kelly, G. W.	Wells, D. K.
Kirkmire, N. J.	Zimmerman, N. L.

Member Grade

Orum, R. M., Forester, U.S.F.S., Culp Creek, Ore. (Junior, 1949).

Scott, F. W., Forester, Long-Bell, Scottsburg, Ore. (Junior, 39R55).

Affiliate Grade

Shaner, B. A., Forester, U.S.F.S., Estacada, Ore.; Mich. College of Mining & Tech., B.S., (Forest Mgmt.), 1953.

Gulf States Section

Student Grade

LOUISIANA STATE UNIVERSITY

Strickland, F. R.

Junior Grade

Students Eligible for Automatic Advancement

LOUISIANA POLYTECHNIC INSTITUTE

Bailiff, T. C.	Mety, M. P.
Bottoms, J. W.	Nugent, J. A.
Davidson, J. H.	Young, R. A.
Hollis, B. M.	

LOUISIANA STATE UNIVERSITY

Bennett, F. C.	McConnell, J. L.
Croxton, E. F.	Miller, J. P.
Dalrymple, R. K.	Murray, L.
Foil, R. R.	Norton, C. M.
Ford, J. C.	Prescott, J. M.
Griffin, J. W.	Purvis, G. M.
Guenard, J. H.	Reinhardt, E. J.
James, P. H.	Smith, B. J.
Logan, C. A.	Trewolla, W. P.
Lytle, J. L.	Varnado, H. W.
Maxwell, J. E.	Whatley, C. V.

Member Grade

Adkins, V. C., Service Forester, Southern Advance Bag & Paper Div., Gair Co., Inc., Hodge, Louisiana; L.S.U., B.S.F., 1950. (Junior, 1950).

Affiliate Grade

Lindsey, S. L., District Forester, International Paper Co., Silsbee, Texas; Stephen F. Austin State College, B.F., (Management), 1949.

Inland Empire Section

Junior Grade

Students Eligible for Automatic Advancement

UNIVERSITY OF IDAHO

Bynum, H. H.	Preston, P. C.
Gregg, J. B.	Stauber, R. L.
Kizer, R. D.	Varseveld, F. R.
McAlister, R. H.	Wilcox, J. T.

Intermountain Section

Junior Grade

Students Eligible for Automatic Advancement

UTAH STATE AGRICULTURAL COLLEGE

Bills, J. E.
Bones, J. T.
Brunson, R. H.
Elder, F. S.
Gasior, K. V.
Hightree, P. E.
Irby, C. H.
Lee, H. S.
Picht, C. W.
Ruetz, E. P.
Taylor, L. E.
Watts, W. J.

Kentucky-Tennessee Section

Member Grade

Joy, F. L., 1694 Overton Park Ave., Memphis, Tenn. Reinstatement.

New England Section

Student Grade

UNIVERSITY OF MASSACHUSETTS

Curtis, C. R.
Kupa, J. J.

YALE UNIVERSITY

Hoffman, B. F.

Junior Grade

Smith, R. S., Service Forester, Maine Forest Service, Skowhegan, Maine; Univ. of Maine, B.S.F., 1954.

Students Eligible for Automatic Advancement

UNIVERSITY OF MASSACHUSETTS

Aho, P. E.
Bruso, R. J.
Buker, F. M.
Carson, R. G.
Dane, C. H.
Hudson, N. W.
Kimball, E. C.
Long, G. R.
MacInnis, P. M.
Orciuch, P. S.
Selin, A. S.
Sisterhenm, G. H.
Whittaker, B. J.

YALE UNIVERSITY

Daniels, J. P.
Fowler, D. P.
Goudy, A. C.
Hermann, R. K.
Noyce, P. B.
Peters, J. E.
Thompson, W. P.

New York Section

Junior Grade

Students Eligible for Automatic Advancement

STATE UNIVERSITY OF NEW YORK

Adams, R. E.
Ayars, W. B.
Balon, E. J.
Bassett, F. W.
Blessing, H. O.
Braman, G. S.
Carpenter, R. L.
Davis, J. L.
Duffy, J. P.
Edwards, W. J.
English, J. E.
Fromm, W.
Glass, R. J.
Hamilton, P. C.
Knight, C. R.
Lawton, D. P.
Leuschner, W. A.
Metzger, R. E.
Miller, R. W.
Murphy, R. F.
Namkoong, G.
Nickle, W. R.
O'Keefe, C. T.
Scherer, W. D.
Schroeder, W. J.
Talerico, R. L.
Watson, G. E.

Northern California Section

Junior Grade

Flynn, R. E., Dist. Ranger, U.S.F.S., Mariposa, Calif.; Ore. State, B.S.F., 1948.

Students Eligible for Automatic Advancement

UNIVERSITY OF CALIFORNIA

Bouse, T. M.
Bunnell, W. L.
Clabaugh, R. W.
Dealey, D. S.
Jessen, R. W.
Knauf, E. R.
Ladd, M. W.
McDonald, R. J.
Razzeto, J. H.
Remmy, K. F.
Turner, D. N.
Wakskal, H. E.
Waldron, B. A.

Affiliate Grade

Lubanski, J., Forester, Berry Lbr. Co., Pine Grove, Calif.

Northern Rocky Mountain Section

Junior Grade

Students Eligible for Automatic Advancement

MONTANA STATE UNIVERSITY

Addor, E. E.
Belcher, F. A.
Christman, P. D.
Crozer, E. A.
Johnson, D. V.
Johnson, R. F.
Olson, R. H.
Ortengren, R. E.
Patterson, T. F.
Rounds, J. A.
Rouse, C. E.
Rundle, R. F.
Stofle, P. C.

Ozark Section

Junior Grade

Students Eligible for Automatic Advancement

UNIVERSITY OF MISSOURI

Coates, J.
French, H. S.
Hilliard, R. E.
Lamar, A. J.
Roloff, G. A.
Wolf, H. L.

Puget Sound Section

Student Grade

UNIVERSITY OF WASHINGTON

Baldwin, R. L.

Junior Grade

Students Eligible for Automatic Advancement

UNIVERSITY OF WASHINGTON

Abrahamson, D. P.
Baldwin, R. L.
Benson, S. A.
Blanchard, J. D.
Dalrymple, L. K.
DeHoll, F. G.
Flora, D. F.
Franklin, R. M.
Haase, J. A.
Harding, R. A.
Hawley, R. J.
Johnson, P.
Kellie, W. N.
Lohr, J. R.
Parnell, H. L.
Partee, D. W.
Picketts, W. N.
Pierson, D. E.
Rotter, E. A.
Rush, D. E.
Schimel, R. D.
Smith, I. E.
Smith, T. G.
Waldhaus, F. H.
Welsh, R. H.
Wilson, G. C.

Member Grade

Batey, T. E., Research Tech., Douglas Fir Plywood Assoc., Tacoma, Wash. (Junior, 1949).

Gross, D. C., Forester, Kitsop County Assessors Office, Port Orchard, Wash. (Junior, 48R55).

Affiliate Grade

Ruston, P., Asst. Dist. Forest Warden, State of Wash., Ellensburg, Wash.

Southeastern Section

Student Grade

UNIVERSITY OF FLORIDA

Barnes, C. H.

UNIVERSITY OF GEORGIA

Booth, W. F.
Hays, J. C.
Houghton, H. S.
McCorkle, J.
Mills, R. T.
Thornton, B. I.

Junior Grade

Lewis, D. J., 2237 Herschel St., Jacksonville, Fla. Reinstatement.

Owens, T. P., Field Asst., International Paper Co., Jasper, Fla.; Univ. of Fla., B.S.F., 1951.

Students Eligible for Automatic Advancement

ALABAMA POLYTECHNIC INSTITUTE

Baxter, J. D.
Britt, R. W.
Goodrick, F. E.
Smith, C. D.

UNIVERSITY OF FLORIDA

Barnes, C. H.
Callaway, G. E.
Hausman, D. W.
Hinkle, E. H.
Moody, C. W.
Stewart, D. P.

UNIVERSITY OF GEORGIA

Allen, G. J.
Barbaree, J. A.
Beall, G. S.
Bentley, C. F.
Booth, W. F.
Butts, P. M.
Carswell, S. G.
Crane, W. B.
Dumbroff, E. B.
Eidson, D. S.
Freyer, D. C.
Harley, C. L.
Hays, J. C.
Henry, G. W.
Jones, W. M.
McCorkle, J.
Meadows, J. M.
Mills, R. T.
Mohla, D. G.
Morrison, A. A.
Roberson, D. P.
Roberts, C. D.
Steele, J. L.
Swindel, B. F.
Terry, R. J.
Vickers, B. E.
Weaver, R. F.

Member Grade

Arlen, W., Dist. Ranger, U.S.F.S., Quincy, Fla. (Junior, 1949).

Arnold, C. A., Dist. Forester, Ga. Kraft Co., Roberta, Ga. (Junior, 1949).

Eaton, J. W. C., Asst. Ranger, U.S.F.S., Double Springs, Ala. (Junior, 1949).

Gillis, L. A., Asst. Forest Supv., Union Bag & Paper Corp. Townsend, Ga. (Junior, 1948).

Rowston, W. J., Area Mgr., Rome Kraft Co., Newnan, Ga. (Junior, 1949).

Sneidman, W. C., Dist. Supv., International Paper Co., Chipley, Fla.; Univ. of Fla., B.S.F., 1952. (Junior, 1952).

Wildes, H. C., Forester, E. L. Tillman & Co., Surrency, Ga. (Junior, 1949).

Affiliate Grade

Clark, J. T., Forest Tech., International Paper Co., Bonifay, Fla.; V.P.I., B.S., (Forestry), 1953.

Lorenzo, L. W., County Forest Ranger, Ga. Forestry Comm., Appling, Ga.

Upper-Mississippi Valley Section

Student Grade

IOWA STATE COLLEGE

Brown, R. W.

UNIVERSITY OF MINNESOTA

Stevens, H. L.

Junior Grade

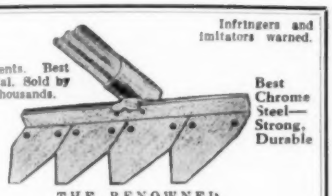
Hyvarinen, M. J., Products Eng., Minn. & Ont. Paper Co., Minneapolis, Minn.; Univ. of Mich., M.F., 1951.

White, R. A., Asst. Dist. Ranger, U.S.F.S., Grand Marais, Minn.; Iowa State, B.S.F., 1948.

Students Eligible for Automatic Advancement

IOWA STATE COLLEGE

Andreas, L. G.
Berlyn, G. P.
Lefler, M. E.
Lindquist, L. A.



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Gill, R. B.
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Merriman, M. M.
Prestemon, D. R.
Svensen, W. T.

UNIVERSITY OF MINNESOTA

Anderson, K. N.
Carson, R. E.
Glain, G. N.
Holm, C. A.
Johnson, F. E.
Kohrt, R. C.
Lankton, J. F.
Lundgren, J. W.
McCutchen, L. R.
Reinke, M. L.
Resman, W. A.
Rodewald, J. S.
Rosenberg, H. L.
Salzman, J. A.
Schnack, C. D.
Stevens, H. L.
Zelle, M. J.

Associate Grade

Anderson, C. J., Agronomist Land Mgr., Iowa Ordnance Plant, Burlington, Iowa; Univ. of Ill., B.S., (Agriculture), 1947.

Wisconsin-Michigan Section

Junior Grade

Hiller, R. L., Supv., Tech. Service, American Cyanamid, Chicago, Ill.; Univ. of Minn., B.S.F., 1938.

Mossholder, R. E., Forester, Forestry Associates Inc., Hart, Mich.; Mich. State, B.S.F., 1951.

Students Eligible for Automatic Advancement

MICHIGAN STATE UNIVERSITY

Andersen, D. W.
Bailey, J. C.
Benjamin, R. O.
Besonen, R. R.
Brown, B. G.
Clutter, J. L.
Herrick, H. F.
Hynes, J. P.
Kuester, F. R.
McElroy, E. B.
Norton, G. N.
Quinkert, A. K.
Rappel, D. C.
Tikka, R. L.

UNIVERSITY OF MICHIGAN

Aughey, W. H.
Bach, H. A. R.
Benzie, J. W.
Black, P. E.
Caddis, A. J.
Calkins, P. S.
Fischer, W. C.
Gerardo, M.
Hart, G. E.
Heikkenen, E. A.
Hoover, J. T.
Johnson, C. M.
Jones, H. B.
Jones, R. D.
Kraus, J. F.
Penny, W. R.
Scharf, R. M.
Weisz, A. E.
Yates, D. A.

Member Grade

Bottke, E. A., Park Mgr., Mich. Dept. of Cons., Pinckney, Mich. (Junior, 47R50).

Carlson, G. A., Vice President, Wood, Inc., Augusta, Wis. (Junior, 1949).

Chern, J., Wood Tech., Forest Products Lab., Madison, Wis. (Junior, 1949).

Ehly, A. E., Dist. Forester, Wis. Cons. Dept., Menomonie, Wis. (Junior, 1949).

Lovestead, H. S., Area Supv., Consolidated Water & Paper Co., Prentice, Wis. (Junior, 1949).

Lupa, A. J., Forester, Wis. Cons. Dept., Gordon, Wis. (Junior, 1949).

Foreign

Junior Grade

Scarff, J. G., Forester, West Indies Sugar Corp., Dominican Republic; Yale, B.A., 1938.

Member Grade

White, J. A., Asst. Forester, U.S.O.M., Monrovia, Liberia. (Junior, 1949).

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- Brush removal
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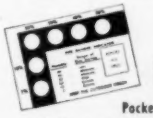
Fighting fire with fire in backfiring critical areas or using fire as a land or debris clearing tool, you, as fire manager know how important it can be to have fire when and where you want it.



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Forestry News

E. L. Demmon, 11 Other Forest Service Members Honored

E. L. Demmon, director of the U. S. Forest Service Southeastern Forest Experiment Station, Asheville, N. C., was honored June 5 by receipt of the Distinguished Service Award of the U. S. Department of Agriculture, while eleven other members of the Forest Service received Superior Service Awards. The Department's Annual Honor Awards Ceremony was held on the Washington Monument Grounds in Washington, D C. with Secretary of Agriculture Ezra Taft Benson presenting the awards. Mr. Demmon's citation read:

For meritorious service in furthering forest research, in stimulating public thinking towards wiser use of forest land and water resources, and in helping shape national and regional forest policies.

Recipients of Superior Service Awards were as follows:

Carl R. Barr, Northeastern Forest Experiment Station; Bill Bergoffen, Washington Office; Stephen J. Booth, Los Padres National Forest; John K. Brownell, Ottawa National Forest; Walter J. Buckhorn, Pacific Northwest Forest and Range Experiment Station; Harry D. Grace, Angeles National Forest; Horace E. Hedges, regional office, Intermountain Region; Wallace M. Johnson, Rocky Mountain Forest and Range Experiment Station; Jenckes Mason, Washington Office; Mildred M. Moler, Washington Office; and Clifford S. Schopmeyer, Southeastern Forest Experiment Station.

Forest Fires at a Post-War Low in 1955

Forest fires were at a post-war low record in 1955, even though man-caused fires occurred at the rate of 380 a day, the U. S. Department of Agriculture announces.

Of the 145,180 forest fires reported last year, 134,800 were man-caused, according to a Forest Service compilation of reports from state foresters and land managing agencies of the Departments of Interior and Agriculture, covering all private, state, and federal lands receiving organized protection. The remaining forest fires were caused by lightning. The total acreage burned was 8,068,601. In 1954, 176,891 forest fires, of which 166,278 were man-caused, burned 8,832,963 acres.

The largest single cause of fires last year was incendiarism, which accounted for 25,773 forest fires on lands receiving organized protection. About 94 percent of the "set" fires occur in the South, where the states have just started a vigorous campaign against incendiarism.

This year the total area of state and private land under protection is at an all-time high of 387,156,000 acres. About 43,953,000 acres of state and private land still lack organized protection.

The number of forest fires by major causes in 1955 and 1954 on protected land follows:

Causes	*1955*	*1954*
Incendiary	25,773	40,520
Debris burners	20,334	30,318
Smokers	15,870	23,330
Campers	3,889	4,875
Lumbering	2,491	2,928
Railroads	2,582	2,872
Misc. man-caused	10,404	14,650
Lightning	6,261	7,780

Forest Products Research Society Meets

Forest Products Research Society elected its 1956-57 executive board at the tenth national meeting in Asheville, N. C., June 4-8.

Ralph H. Besecher of Pittsburgh succeeded M. B. Christian of Tallulah, La., as president. Frank H. Kaufert of St. Paul, Minn., was chosen president-elect and Frank J. Rovsek, ex-

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Mississippi

—applies new controls to an old problem

More than half of Mississippi's total land area is in forests. Timber resources, valued at $600,000,000, place the state fourth in the nation in timber production. And, within the state, the economic importance of timber is surpassed only by cotton.

Great pine forests to the south give Mississippi rank among the producers of turpentine, pulp and paper products. In addition, the uplands support abundant hickory, white oak, honey locust, poplar, maple and sycamore; willow, bald cypress, tupelo, sweet and black gum thrive along lowland stream banks.

Mississippi leads the nation in production of tung oil,—a product of the tung tree.

Forest lands now operate under an enlightened management program. In 1952, the output of tree nurseries within the state (—1 private, 2 state and 1 federal) was the largest of the 12 southern states.

By 1951, 72% of the forest land was under fire protection, but fires continued to take an alarming toll. Nearly 2 million acres were burned in 1954, when state legislation was passed transferring woods burning from a misdemeanor to a criminal offense.

The law covers two basic situations,—the deliberate or malicious setting of fires to woodlands, etc., and wanton negligence that results in this kind of fire.

With this law to give teeth to its determination, Mississippi forest management hopes to show greater progress in their conservation move.

Marking trees for cutting over a 2 to 3 year period, or for stump checks following winter ice and snow . . . replacing tedius tagging in growth and disease studies . . . these and other long-term marks are now assigned by alert foresters to paints once reserved exclusively for boundary marking.

It is well known among users and manufacturers alike that colors react differently to weathering. Thus, in a line that includes bright (seeing) red, yellow, orange, blue, white, aluminum . . . each Southern Glo boundary paint color is produced by the individual formula which yields best visibility and endurance as shown by continuing field and laboratory tests.

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ecutive secretary. New regional board members are: Charles R. Lockard, northeast; John D. Ritchie, northwest; Robert L. Hiller, northcentral; W. L. Irwin, southeast; W. R. Warner, southcentral; Raymond H. Berry, southwest.

Approximately 1,000 people attended the meeting sessions and social functions during the four-day meeting.

At the technical session more than 60 papers covering such subjects as wood preservation, chemistry of wood, and furniture production were read. Seventy-five national concerns, universities, colleges, and research laboratories prepared displays for the "Forest Products Suppliers' Exhibit," held throughout the meeting.

Reuben B. Robertson, president and chairman of the board of Champion Paper & Fibre Co., Canton, N. C., presented the main address, "Forestry and Forest Products Research," at the official luncheon June 5.

New Alaska Wilderness Area Proposed

Regional Forester A. W. Greeley has issued notice under date of May 1, 1956 of the proposed classification of a 283,000 acre wilderness area on the North Tongass National Forest in Alaska. The proposed area is called the Tracy Arm-Fords Terror Wilderness Area. Under the provisions of Regulation U-1 of the Secretary of Agriculture, six months public notice is required of such proposed classifications.

A map showing the proposed boundaries or other information regarding the area may be secured from the Forest Supervisor, North Tongass National Forest, Juneau, Alaska, or from the Regional Forester, Federal Building, Juneau. Any persons objecting to the proposals should address their objections to the latter official of the U. S. Forest Service on or before November 1, 1956.

N.L.M.A. Meets in Seattle

The National Lumber Manufacturers Assn. held its 1956 spring meeting in Seattle, Wash., May 28-30, with an attendance of 175 lumbermen and others interested in industrial development.

Resolutions approved by the directors called for Congressional action to bring about a reappraisal of government land ownership and a more detailed reporting of national forest management activities; authorized an expansion of N.L.M.A. research activities; congratulated the U. S. Chamber of Commerce for its work in modernizing building codes; and applauded the National Paint, Varnish and Lacquer Assn. for cooperating with N.L.M.A. in a program to improve paint performance on wood.

A highlight of the three-day meeting was a panel discussion on lumber's future as seen by retail lumber dealers, home builders, and building code officials.

Southern Forest Tree Improvement Committee Meets

Members of the Southern Forest Tree Improvement Committee held their semi-annual meeting in Asheville, N. C. May 22-23. Discussion dealt with recent progress in the field of forest genetics in the South. Reports were presented by members of the committee and special guests. Plans were made for a Southwide general meeting. Purpose of the group is to promote and coordinate research on the selection and breeding of better trees for Southern forests. Specific aims include trees of faster growth, higher quality, and increased pest resistance for the tremendous planting program in the South, which now totals ½ billion trees a year.

P. C. Wakeley reported on 4-year progress of the Southwide Pine Seed-Source Study, a cooperative project involving industry and state and federal forest services in fourteen states. Plans were made for the 4th Southwide Forest Tree Improvement Conference to be held at the University of Georgia, Athens, January 8-9, 1957.

The second day of the meeting featured a tour of forest plantations at the Biltmore Estate which were started in 1892 by Dr. C. A. Schenck. This is the oldest white pine plantation in the South. The afternoon field trip con-

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sisted of a tour of Bent Creek Experimental Forest and observation of studies in forest tree regeneration.

The Southern Forest Tree Improvement Committee consists of workers in the field of forest genetics who represent state forest services, the U. S. Forest Service, the pulp and paper industry, the lumber industry, and educational institutions.

Lake States Tree Improvement Committee Meets

The University of Michigan Biological Station near Cheybogan was host to 20 foresters and geneticists June 21-22 at a meeting of the Lake States Forest Tree Improvement Committee.

Representatives from universities, government and industry discussed methods of forest improvement. Stephen H. Spurr, professor of silviculture in the University of Michigan School of Natural Resources was in charge of the program.

Professor Spurr will also represent the University at two international meetings later in the summer. He will attend a meeting of the International Union of Forest Research Organizations in Oxford, England, and a Stockholm, Sweden, meeting of the International Congress of Photogrammetry.

Private & Industrial

Industrial Tree Nursery Renamed for Col. Greeley

The West Coast Lumbermen's Association and Industrial Forestry Association have signed a 20-year lease for the operation of Forest Industries Tree Nursery at Nisqually, Washington.

The boards of directors of the two associations have renamed the nursery to honor and commemorate the late Colonel W. B. Greeley, outstanding American forester. The nursery will now be known as "COLONEL W. B. GREELEY FOREST NURSERY."

The nursery was started by West Coast Lumbermen's Association in 1942 and has grown 75 million trees for artificial reforestation on tree farms in western Washington and Oregon. It is the West's largest forest tree nursery and is a nonprofit enterprise.

The Industrial Forestry Association, which will operate the nursery, is now completing construction of permanent research facilities at the nursery for its long-term forest tree improvement program under Dr. J. W. Duffield.

The nursery's seedling capacity has been expanded three times in the last four years and is being expanded further this year. This, despite the reduced necessity for hand planting because of improved timber harvesting practices and forest protection of the last 15 years.

"Renaming the nursery for Colonel Greeley testifies to the high regard in which the forest industries and the forestry profession held him," said W. D. Hagenstein, executive vice president of the Industrial Forestry Association. "Colonel Greeley, more than any other man, was responsible for the founding of the nursery as part of the industry's forestry programs, which he began when he first took the helm of the West Coast Lumbermen's Association in 1928."

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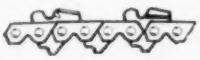

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Ore., has announced two management changes—the appointment of Clarence W. Richen as his administrative assistant, and the promotion of George H. Schroeder to chief forester, the position held by Mr. Richen prior to his new appointment. Both men will continue to make their headquarters in Portland.

Mr. Richen is a graduate of Oregon State College School of Forestry. He is a native Oregonian, and prior to coming with Crown Zellerbach he worked for the Mt. Hood National Forest and the U. S. Forest Service Experiment Station. He left the U. S. Forest Service Experiment Station to join the faculty of Oregon State College where he remained until his employment by Crown Zellerbach in 1942.

Mr. Richen has been actively identified with forest industry groups. He is chairman of the Forest Industries Nursery Committee and an active member of the Industrial Forestry Association; a member of the Management Committee of Western Forestry and Conservation Association; chairman of the Western Forest Pest Committee's subcommittee on research which is a group sponsored by the Western Forestry and Conservation Association, and a member of the Board of Trustees of Scientists of Tomorrow. He is an active member of the Forest Products Research Society and the S.A.F. and is associate editor of the JOURNAL OF FORESTRY. He recently attended the Stanford University Graduate School of Business and the industrial forestry seminar at Yale University.

Mr. Schroeder joined Crown Zellerbach in August, 1946 as assistant chief forester, handling supervision of the Corporation's fire protection and reforestation program under the direction of the chief forester.

Mr. Schroeder is a graduate of Oregon State College School of Forestry, with a master's degree in silviculture. His experience in western forestry, includes logging experience with various timber companies in Oregon, Washington and California, and he has worked for the U. S. Forest Service, the U. S. Forest Service Experiment Station and the Oregon State Forestry Department at Salem. He was also a professor on the Oregon State College forestry school staff for a period of six years. Prior to his association with Crown Zellerbach he was forest engineer for Western Pine Association.

Mr. Schroeder's affiliation with forest industry groups include chairman of the Forest Soils Committee of the Douglas-fir region; director of Klamath Forest Protection Association; director of Evergreen Loggers Radio Association; director of Washington Forest Fire Association; member of the western division of the Forest Industries Radio Communications; member and past chairman of the Columbia River section of the Society of American Foresters. He was one of the group participating in the guided study in Industrial Relations and Business sponsored by the U. S. Chamber of Commerce through the local chamber.

Harry S. Mosebrook Added to New York Office Staff, APA

Harry S. Mosebrook filled a new position as forester with the American Pulpwood Association effective May 16th. In making this announcement, W. S. Bromley, executive secretary of the association, points out that forester for the association, Mosebrook will assume primary responsibilities for conducting its forestry legislation and industrial forestry programs. Mosebrook's headquarters will be at 220 East 42nd Street, New York City.

Mosebrook went to A.P.A. from the Chamber of Commerce of the United States in Washington, D. C., where he was responsible for the forest industries section of the Natural Resources Department since 1952. His practical experience prior to 1952 included working as forester for Monongahela Power Company in West Virginia, and teaching at the New York State College of Forestry as assistant professor of forestry. He received his B.S. degree in forestry from the University of Minnesota, and his M.F. from the University of Michigan. Mosebrook served in World War II in the Corps of Engineers, and in the Korean War as Captain in Artillery Intelligence.

Gair Woodlands Scholarships Announced

T. W. Earle, president of Gair Woodllands Corp., Savannah, Ga., recently announced the award of two forestry scholarships to successful candidates from high schools in Georgia and Florida. Made with the intent of creating a greater interest in the study of forestry among outstanding high school graduates, the awarded scholarships are each for a total of $2,000 for four years of study.

Winners of the scholarships were William R. Truluck, Suwannee Country, Fla., and Bill E. Patterson, Metter, Ga. The students were selected

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from groups of candidates by a Final Awards Committee for each state. Serving on the Florida committee were C. M. Kaufman, dean, School of Forestry, University of Georgia, C. H. Coulter, state forester, H. J. Malsberger, Southern Pulpwood Conservation Assn., and E. D. Martin, Gair Woodlands Corp. The Georgia committee consisted of Archie E. Patterson, acting dean of the School of Forestry, University of Georgia, Leon Hargrave, assistant to the state forester, and Messrs. Malsberger and Martin.

Fraunberger Heads Lumbermen's Merchandising

Robert C. Fraunberger has been named president and general manager of Lumbermens Merchandising Corp., Philadelphia, Pa. He has been vice president and general manager since September 1955.

Yoder Heads Washington Producers' Council

Ralph E. Yoder of Bellevue, Wash. was recently elected president of the Washington State Chapter, Producers' Council Inc. Mr. Yoder is a member of the S.A.F. and the American Trade Association Executives. The Producers' Council, Inc., with chapters throughout the country and headquarters in Washington, D. C., is the national organization of manufacturers of building materials and equipment.

Louis J. Freedman Retires

Louis J. Freedman, vice president of Penobscot Development Co., Great Works, Maine, has recently retired. He will continue to serve on the company's board of directors and as a representative for the Committee on Imports for the American Pulpwood Industry of the Northeast. Mr. Freedman, who first became manager of woodlands for Penobscot Chemical Fibre Co. in 1919, is widely known throughout professional and industrial circles.

Col. Fischer Retires From Museum Directorship

Colonel Arthur F. Fischer, who for many years was chief of the Philippine Forest Service, and who, following his army service in World War II, was director of the Natural History Museum in San Diego, California, has retired from the museum because of poor health.

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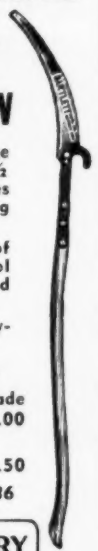

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Public

Maine Entomologist Retires

Henry B. Peirson of Augusta, Maine, recently retired as state entomologist from the Maine Forest Service after thirty-five years of public service.

Mr. Peirson graduated in 1919 from the Massachusetts Agricultural College (now the University of Massachusetts) and took advanced studies at the Harvard Forestry School and Bussey Institute of Harvard University.

As a result of severe outbreaks and losses from the spruce budworm in the state, he was hired by the Maine Forest Service in 1921 as the first state forest entomologist in the country. In 1929 he became the first state entomologist.

He organized and developed a program of forest insect work and a staff of capable entomologists. Under his direction, Maine was the first state to inaugurate forest pest detection work through the forest fire warden force.

Other highlights of his career were development of forest management methods to prevent insect damage, conduction of a large scale parasite rearing project for combatting the European spruce sawfly, and supervision of extensive aerial spraying projects for control of spruce budworm, the yellow headed spruce sawfly, and the gypsy moth in the past two years.

The forest insect laboratory in Augusta was built by CCC crews in 1938 under his planning. Four CCC camps, working under his supervision, carried out forest pest control projects from 1933 to 1941. Perhaps the most widely known of his numerous publications were "Manual of Forest Insects," "Field Book of Destructive Forest Insects," and "Forest Trees of Maine."

He was active in organizing the Northeastern Forest Pest Council, composed of state and federal forest pest control leaders in the northeastern states and eastern Canada, and was the first chairman. He is a member of several scientific organizations in the field of entomology and forestry, including the S.A.F., and in 1954 was honored by the University of Massachusetts with membership in Sigma Xi, honorary scientific society.

Forest Commissioner A. D. Nutting announces that Mr. Peirson has been succeeded as state entomologist by Robley W. Nash. Mr. Nash studied at the Massachusetts Agricultural College and Cornell University, receiving his bachelor's and master's degrees respectively. He was first employed with the Maine Forest Service in 1929 as assistant to Mr. Peirson.

A. E. Wieslander, C. J. Kraebler Retire

A. E. Wieslander and Charles J. Kraebel, both widely known for their research on conservation of natural resources, retired from the U. S. Forest Service June 30 after 40 or more years of federal service.

Wieslander, one of the first men assigned to the newly organized Forest Experiment Station at Berkeley in 1926, entered federal service in 1916. He worked for a time as forester for the Warm Springs Indian Reservation in Oregon and, after World War I, on several national forests in California.

At the experiment station, Wieslander was responsible for the first comprehensive mapping of the vegetation of California and for land-use studies in the Sierra Nevada. Placed in charge of the statewide survey of timber resources in 1938, he became chief of forest economics research at the station in 1946. During this period he pioneered the use of aerial pho-

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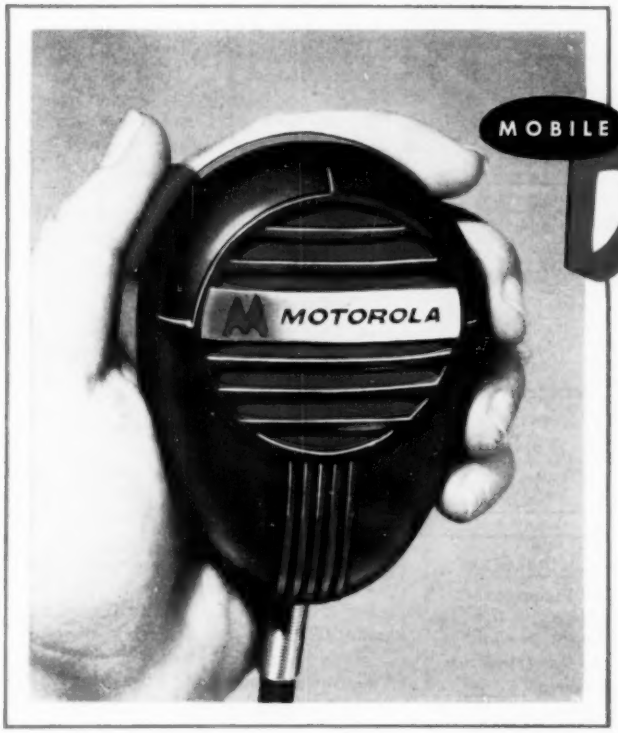

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tography in forest surveys and helped develop methods of mapping soils and vegetation by a combination of aerial and ground surveys.

In 1949, Wieslander was made research specialist in land use for the Forest Service. He has been in charge of mapping soils and vegetation as an aid to determining the best use of forest and range land. To date this project has mapped more than 4 million acres of privately owned land in cooperation with the California Division of Forestry and ultimately will cover some 25 million acres.

Kraebel joined the Forest Service in 1912, when he began studies of forest nursery and planting practices at the Wind River Experiment Station in Washington.

Coming to the California Station in 1927, Kraebel was responsible for research on erosion, flood control, and water production until 1949, when he was named research specialist in watershed management.

Before that, he had served as assistant superintendent of forestry for the Territory of Hawaii from 1920 to 1924 and as Superintendent of Glacier National Park from 1924 to 1927. He, too, served with the A.E.F. during World War I.

In the course of his work in California, Kraebel worked out methods for first-aid treatment of burned watersheds in southern California and for reforestation of land denuded by smelter fumes in northern California. He devised methods now used in mountainous areas throughout the country to stabilize road slopes and supervised development of the upstream flood-control program for the Los Angeles River basin.

In recent years Kraebel was called in by the Canadian government as consultant on forestry problems in the eastern Rockies and by the Allied Headquarters in Japan to investigate watershed and flood control problems.

Both men hold the master's degree in forestry from the University of Michigan. Kraebel was graduated from Michigan in 1912 and Wieslander from University of California in 1914.

J. R. Clark Appointed Vice-Chairman Mississippi Forestry Commission

The Mississippi Forestry Commission at its regular monthly meeting in June appointed James R. Clark vice-chairman. Clark is superintendent of forestry and logging of the Crosby Lumber and Manufacturing Co.,

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Crosby, Miss. The post of vice-chairman was occupied for many years by Robert M. Newton, Sr., whose appointment as a commissioner recently expired. Mr. Clark has been a member of the commission since 1949 and is now serving his third appointment.

J. C. Iler Transferring to Washington, D. C.

James C. Iler, assistant regional forester in charge of the Division of Operation, Northern Region of the U. S. Forest Service, has transferred to a newly created position in the Forest Service office in Washington, D. C., as chief of the Section of Administrative Issuances Coordination, attached to the Division of Operation. This post will be responsible for coordination and correlation of administrative instructions, assignment of organizational authority, and in determination of procedural practices.

Mr. Iler went to Missoula in 1947 from the regional office of the Forest Service in Portland, Ore., where he had been assistant to the Chief of Operation. He obtained his degree in forestry from the Oregon State College in 1930. Following service in various capacities he was named supervisor of the Olympia National Forest in Washington in 1938 and later of the Malheur and Mt. Hood forests in Oregon. In 1943 he was appointed assistant chief of operation at Portland.

Bureau of Indian Affairs Personnel Changes

Percy E. Melis, forestry chief for the Bureau of Indian Affairs, in June became area director for the Bureau in Montana and Wyoming, with headquarters at Billings, Mont. He was succeeded as chief of the Forestry Branch by George Kephart, assistant chief. Henry Wershing of the Portland, Ore., Bureau office was transferred to the forestry staff in the Washington D. C. office.

Hopkins to Head California Watershed Research Station

Walter S. Hopkins has been appointed chief of the division of watershed management research at the California Forest and Range Experiment Station, it has been announced by Dr. George M. Jemison, director of the station.

Hopkins will take the place of the late Dr. E. A. Colman, who died last March after a brief illness.

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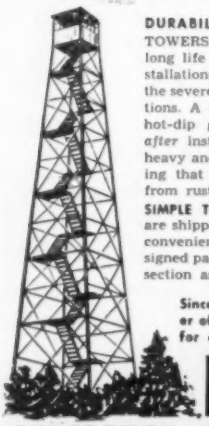

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Center at Marianna, Florida, Hopkins will probably report to his new assignment about September 1.

A graduate of Colorado State College, Hopkins participated in Forest Service studies of water yield and erosion control in the Rocky Mountains during the years 1935 to 1939. From 1939 to 1942 he was employed by the Soil Conservation Service in Colorado.

In 1942 he joined the U. S. Navy. He completed his tour of duty in 1946 as a lieutenant. The same year he joined the staff of the Southern Forest Experiment Station of the U. S. Forest Service and was placed in charge of longleaf pine regeneration work and other phases of forest management at the Alexandria Research Center, in central Louisiana. From 1951 to date he has been in charge of similar work in southern Alabama and western Florida.

Two Foresters in Army Develop Fort Richardson Forest Plans

A comprehensive forest management plan for Fort Richardson, Alaska, has been approved by the Office of the Chief of Engineers, Department of the Army, and returned to the Alaskan post for implementation.

Specialist Third Class Keith D. Henley, forestry graduate of Michigan State University in 1954, and Specialist Third Class Rudolf E. Reichle, forestry graduate of Colorado A & M College in 1954, conducted extensive field work on Fort Richardson's 73,000 acres of white spruce, paper birch, quaking aspen, and black spruce forests during the summer season of 1955. During the fall and winter of 1955-56, the two foresters directed their efforts toward a fact-finding program leading to the written phase of the management plan.

The project was initiated in compliance with current U. S. Army directives, requesting that land and woodland management plans be compiled for all installations within the continental United States, Caribbean, and Alaskan Commands. Further work is underway in the 1956 field season at Fort Richardson, with the conduct of the field work being directed toward sales contracts, silvicultural research peculiar to Interior Alaska, and fire protection.

Stoltenberg Joins Northeastern Forest Experiment Station

Carl H. Stoltenberg, formerly assistant professor of forest economics

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at the School of Forestry, Duke University, has joined the staff of the Northeastern Forest Experiment Station, U. S. Forest Service, Upper Darby, Pa.

Dr. Stoltenberg will be in charge of the Station's work in resource economics. He will supervise studies in the economics of forest protection and in marketing, production economics, and resource analysis.

Dr. Stoltenberg was born in Monterey, Calif. He attended the University of California at Berkeley, where he received a Bachelor of Science degree in forestry in 1948 and a Master's degree in 1949. He did graduate studies at the University of Minnesota, where he received his Ph.D. degree in 1951.

He joined the faculty at Duke University in September 1951. At the Duke University Forestry School he engaged in research as well as teaching, and is author of a number of articles in the field of forest economics. He is secretary of the Division of Forest Economics and Policy of the Society of American Foresters.

Forest Supervisor Changes in Northern Region

Regional Forester P. D. Hanson of the U. S. Forest Service Northern Region, Missoula, Mont., has announced three changes in forest supervisor positions in that region. Zane G. Smith, supervisor of the Lewis and Clark National Forest with headquarters in Great Falls, Mont., has been transferred to a staff position in the Washington D. C. office of the Service. He was succeeded by John Fallman who transferred from the position of supervisor of the Deerlodge National Forest, Butte, Mont. Rolf B. Jorgensen became supervisor of the Deerlodge from the position of staff officer in charge of range and wildlife management and fire control on the Nezperce National Forest in central Idaho.

G. C. Mark Transfers to California

Gordon G. Mark, since 1948 engaged in forest management staff capacities in the State and Private Forestry Division, U. S. Forest Service Eastern Region, with headquarters at Philadelphia, has been transferred to the California Region. His new appointment is to fill the position vacated in the California Region Office by the retirement of Paul R. Kevin. Mark will supervise forest management programs carried out in cooperation with the California Division of Forestry.

Education

Montana to Have Forest Products Lab

President Carl McFarland announced in May that the Missoula area logging and lumbering industries have volunteered to supply the funds for the basic engineering needed to set up a proposed forest products laboratory in the School of Forestry at Montana State University.

Dean Ross Williams of the Forestry School said that the University will secure the services of the Timber Engineering Co., research affiliate of the N.L.M.A., to draw up preliminary plans for the laboratory. The firm will furnish the floor plan and equipment specifications.

In discussing the need for expanded facilities, Dean Williams said that the present lack of space and staff made it necessary to turn away nearly a third of the applicants for admission to the school last fall and that already about a third of the number of students that can be accommodated next year has applied. He stressed that there is a particular need for a forest products laboratory at the University to meet the increasing demand of the

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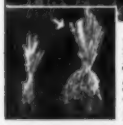

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forest industry for men trained in wood utilization.

Dr. John P. Krier, associate professor of forestry, will direct the new laboratory.

Louisiana Offers Extension Graduate Course

What is believed to be the first off-campus extension graduate course in forestry has just been completed by a group of nineteen industrial foresters in Louisiana.

At the request of several supervisory foresters of the Gaylord Container Corporation Division of Crown Zellerbach Corporation, the Louisiana State University School of Forestry and the General Extension Division organized and presented a course in advanced silviculture for graduate credit. The course was taught at Bogalusa, La., one hundred miles from the University campus by Professor A. Bigler Crow.

Fifteen three-hour class meetings were held on Saturday mornings during the spring semester for the foresters enrolled in the course, all of whom were employed full time while taking the course.

As a result of the interest shown by this group of Gaylord foresters, a similar course was arranged for a second group of Gaylord foresters and was taught on the campus.

Dr. Paul Y. Burns, director of the L.S.U. School of Forestry, said, "We believe that the off-campus extension course for graduate foresters is a promising new way for schools to cooperate with industry."

Graduate Course in Natural Resources Administration Offered

A graduate program in natural resources administration is being offered by the Institute of Public Administration and the School of Natural Resources at the University of Michigan, Ann Arbor, under the direction of the latter. The program, which combines the fields of public administration and conservation, leads to the degree of Master of Science in the Horace H. Rackham School of Graduate Studies. The degree requires the satisfactory completion of thirty-six hours of graduate work, including ten in public administration, twelve in conservation, six in supervised field traning, and eight hours of electives. The course is designed to meet the needs of persons who plan to work in administrative-technical positions, especially in branches of government concerned with natural resources.

Pack Foundation Prize Winner Named

The Charles Lathrop Pack Foundation Forestry Prize for 1955-56 has been awarded to John H Kaufmann, a senior in the N. Y. State College of Agriculture, Cornell University, Ithaca, N. Y. Mr. Kaufman is majoring in the Department of Conservation and has written from first hand experience about Maryland's state forests, the Cedarville State Forest in particular. His essay is entitled "This is Your State Forest." The $40 award is made annually to the winner of a competition involving essays on some subject related to conservation treated from the public point of view for the public benefit. The judges for the competition were Professors Emeritus Bristow Adams and Cedric H. Guise and Professor Lawrence S. Hamilton.

New York College of Forestry Promotes Four on Faculty

Dr. Hardy L. Shirley, dean of the State University of New York College of Forestry in Syracuse, recently announced four faculty promotions at the College.

Those promoted are: Dr. Robert A. Zabel, Dept. of Forest Botany, from associate professor to full professor; Dr. Vivian T. Stannett, Dept. of Forest Chemistry, from associate professor to full professor; Dr. Aubrey E. Wylie, Dept. of Forest Utilization, from assistant professor to associate professor; and Dr. Harold Gatslick, Dept. of Forest Utilization, from instructor to assistant professor.

Forestry Employment

S.A.F. members are privileged to insert one 60-word advertisement in this column without charge. Forest industries desiring to employ foresters may insert advertisements at the rate of $4 per column inch. Copy must be received by the end of this month for an advertisement to appear in the issue after next.

Obviously, the Society cannot assume responsibility beyond making it possible for prospective employee and employer to enter into negotiations.

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